

2015 Performance Review Panel Summary for

Alaska Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

Reported program accomplishments had an excellent match with its strategic plan goals and objectives. An impressive set of accomplishments particularly with its direct connection to fishing community stakeholders in a variety of areas.

Particular significant contributions were:

- Product and process development research on Pollock oil, an improved method to freeze dry pink salmon,
- Publications on innovative byproducts from seafood processing wastes and using fish wastes as compost for home gardeners
- Research on Improved oyster growout techniques using bags that have been adopted by several companies and geoduck culture techniques which has been adopted by one operation
- Extensive outreach and industry training in HACCP certification direct assistance to companies in new product development, techniques to improve product safety and quality at the harvesting and processing levels with a particular focus on shellfish harvesting
- 21 peer reviewed articles in its Alaska King Crab Research, Rehabilitation program
- Long term salmon research leading to increased understanding of stock recruitment and potential use of data in models as environmental changes occur.
- Training, outreach, and publications to help fishing community stakeholders to better understand and become engaged in fishery management processes.

Program had societal contributions in several areas including impacting the fisheries regulatory processes , helping creating an expanding seafood businesses, contributing to the improved safety and quality of Alaskan seafood products , and increasing participation of stakeholders in fisheries management processes.. Specific notable contributions listed below.

Reviewer: Bruce Morehead

Reviewer Type: 1

- 240 Alaskans working at seafood plants earned HACCP certification
- Marine Advisory specialists helped 12 businesses expand their product offerings, and assisted four new businesses in developing new products
- First AK geoduck farm established
- Proportion increase in number of oyster farmers following best management techniques
- Alaska Sea Grant provided key information to state agencies, which resulted in new shellfish farming permit regulations that make the regulatory process more efficient and ease the burden on new applicants and existing farmers.
- Monitoring Programs for PSP in Dungeness crab and oysters have protected public safety

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DRAFT Rating: 1.5

AKSG has invested \$1,686,042 in the SSSS focus area during the review period. The impacts listed were substantial and impressive and it is quite clear that AKSG is positioned as a major player in Alaska's major seafood industry. Most of the program's program objectives were met or exceeded and for those few that were not, satisfactory reasons were provided for why not.

The Alaska King Crab Research, Rehabilitation and Biology (AKCRRAB) program has made progress in understanding the feasibility of raising king crab in a hatchery to rehabilitate wild stocks. Between 2010 and 2013 the program published 21 peer-reviewed articles. In 2014, the first hatchery raised crab were outplanted in the wild to assess survival.

Based on work by AKSG extension, American Marine Ingredients, a subsidiary of American Seafoods Group in Seattle, released a pollock oil diet supplement.

AKSG developed a new freeze-drying process that cuts the freeze-drying time from 20 hours to about nine hours. The new process involves a technique for heat treating the raw material to make the moisture in the salmon easier to remove.

An Alaska Sea Grant funded graduate student and Marine Advisory specialists confirmed the existence of a high performance, superior quality broodstock oyster seed, which performs well for Alaska shellfish farmers.

Over 400 Alaskans have earned HACCP certification through ASG's program. In general, AKSG has conducted numerous classes for the seafood industry that has led to improved skills by the industry (smoked fish, marine refrigeration, slush ice bags).

Through AKSG assistance, Pickled Willys LLC, has sold a new pickled seafood product in 13 retail markets across six states. The company has three fulltime employees with a payroll of \$190,000 at their main retail store in Kodiak. This year they sold 2,400 cases of pickled seafood valued at \$288,000 wholesale and 4,800 pounds of frozen crab tails valued at \$48,000 wholesale.

In 2011 Alaska Sea Grant found high levels of the paralytic shellfish poisoning toxin in Dungeness crab near Haines, Alaska, leading to a ban on the sale of live and whole commercially caught Dungeness crab

Reviewer: Jim Murray

Reviewer Type: 2

from that region, and a state advisory that recreationally and subsistence harvested crabs be cleaned of their viscera before consumption.

As a result of an applied research project, three Southeast Alaska farms have converted to bag culture, and twelve farms have had permit modifications approved to enable bag culture. Sealaska Corporation, an Alaska Native corporation, is converting existing farms to bag culture and planning for new farms that were initiated during major expansion into oyster farming in 2009 to incorporate bag culture.

AKSG's work to support product development for small Alaska seafood processors to for products such as smoked salmon, dried salmon jerky, mustards and barbecue sauces, canned herring, military MealsReadytoEat salmon entrees, salsas, dried pollock, halibut skin dog treats, pickled fish, crab tails, and salmon oil is most impressive.

Based on the 25 years of experience of AKSG's aquaculture specialist, he aided the state in revising permit regulations and new data collection systems were created, allowing farmers to be accountable to the state but reducing report writing.

The Alaska Department of Fish and Game approved an Alaska Sea Grant proposal to modify import regulations, bringing oyster seed to Alaska in time for the growing season and assuring annual production and revenue to the industry.

Two extension specialists received the 2012 Outstanding Achievement Award from the Alaska Forum on the Environment for their program to train Aleutian Island community residents to monitor for the presence of paralytic shellfish poisoning (PSP) toxin which raised public awareness and likely averted human illness and possible death.

A seven year growout study successfully tested geoduck culture practices, and provided growth and survival data for cultured geoduck clams. Metlakatla community leaders are now beginning their first largescale commercial geoduck farm.

2015 Performance Review Panel Summary for

California Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

Overall, the investment in SSS = 22.4% of the overall CASG programmatic effort and 20 impacts and 13 accomplishments were reported. The Program objectives were almost all met and most were significantly exceeded. CASG seemed to “live the plan” for SSS and the program's impacts and accomplishments nicely dovetail with the plan's goals and objectives. The impact and accomplishment statements were well written and clearly described numerous and significant accomplishments in science and technology and how society benefitted from the program. I would have preferred to have seen more summary data (# of journal articles, jobs created, etc.) provided for the focus area in the introduction, but overall the the program did a very nice job in capturing the positive contributions it had mad to the state of California and beyond.

Numerous and significant S & T impacts were identified and a few of the important examples of impacts are as follows.

A number of projects positively impacted fishery management programs. For example, CASG was the first to evaluate potential changes in fisheries inside and outside the Rockfish Conservation Area over time, which informed CAF&G stock assessments. A sampling program for lobsters and crabs contributed to the evaluation of biotoxin levels in commercially fished products which led to the eventual lifting of a seafood safety advisory that had been in place for over a year.

CASG has invested nicely in developing cooperative programs between fishermen and fishery managers. Since the California Collaborative (CCFRP) project began in 2007, CASG has completed 148 days of fishing, employed 15,070 volunteer hours from 467 individuals and caught a total of 27,441 fish from 43 different species, which has helped to inform fisheries management in the state.

CASG long term investments in a fish egg sampler has led to a new tool for estimating fish egg densities at sea. The instrument is being used in highly productive waters around the globe to improve management of small pelagic fishes. The fish egg data is used to assess densities of Pacific sardine, northern anchovy and jack mackerel eggs and, notably, to annually estimate the sardine population in U.S. waters. Ten other nations also currently deploy CUFES to gather information on small pelagic fish stock sizes and spawning habitats.

Benthic habitat maps for Humboldt Bay and Eel River Estuary are being used by at least 7 agencies for management purposes.

Reviewer: Jim Murray

Reviewer Type: 1

Scientists documented shifts in the timing of spawning of 26 of the region's 43 most common fish species based on climate change information that is helping marine fisheries managers (PMFMC) figure out how to adjust seasonal management practices so that they remain effective in the face of climate change.

CA Sea Grant efforts facilitated the opening of San Diego's first open air fishermen's market which has averaged to date seafood sales of 6700 lbs. per month by 18 fishermen to nearly 1400 people.

Based on an analysis of stream barriers, ~10 miles of previously inaccessible stream habitat was opened up for enhanced Coho salmon reproduction.

In the area of aquaculture, there were numerous impacts including helping abalone farmers by researchers developing a new silage production method developed and tested at the Monterey Abalone Company) to keep abalone stock fed during times of kelp shortages. It is anticipated that all California abalone farms will utilize this dried kelp as a feed stock sometime during the year. The graduate student on the project subsequently developed a "salted" kelp product that is now being fed to abalone in winter. Through the technique, the company is able to store a two month supply (about 30 tons) of food for its abalone, reducing feed and labor costs by about \$50,000 annually.

Yields from a new oyster seed outperformed industry standard seed by 2 percent, 6 percent and 8 percent at the three farms tested. Applied across the U.S. West Coast, the higher yielding seed could add about \$21 million to the oyster industry's value over a decade.

Two entirely plant based fish feeds have since been commercialized and are now being tested at Pacifico Aquaculture an open ocean offshore facility in Ensenada, Mexico that recently earned a "best aquaculture practices" certificate. It is the first time an entirely plant based feed has ever been tested under production scale conditions for these species.

Sea Grant funded scientists and extension staff employed modern genomic technologies to discover the key genes and biochemical pathways that might serve as novel biomarkers for early detection of superior hybrid oysters. Commercial quantities of "improved" hybrid seeds were distributed to three California farms for assessment of yield. For the west coast industry, with an estimated value of around \$94 million, widespread use of double hybrid oysters could generate an additional \$2.0 to \$8.0 million in industry revenue.

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California Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

Program accomplishments, impacts, performance measures and objectives are directly linked to its Strategic Plan and appeared to be supported primarily with SG funds. Program impacts were mostly in CA, although its web based outreach on HACCP training has subscribers from 55 countries. With 22% of SG total investment going to Sustainable Seafood, science/technology contributions were commensurate with program size. One of the few programs recording breakdown of funding by focus area.

Notable contributions were:

- An evaluation of potential changes in fisheries inside and outside the Rockfish Conservation Area over time, informing stock assessments.
- Development of an improved hybrid oyster seed to increase farmed oyster yields
- Research on social/economic impacts of fishery management on fishing communities that will better inform assessments carried out by Federal/State Managers
- Development of a kelp production method to support abalone production
- Research results to address bottlenecks in advancing the survivability of cultured tuna in early life stages
- Development of a plant based feed to support Seabass and Yellowtail culture
- Conduct of a biotoxin monitoring program

Program exceeded all performance measures and achieved all program objectives. Specific program benefits achieved are:

- The California Collaborative Fisheries Research Program, created and managed by CASG Extension Specialist Rick Starr, engaged hundreds of citizen volunteers in the 2010-2013 reporting period to gather data on more than forty fish species in Central California and contributed to the fishery

Reviewer: Bruce Morehead

Reviewer Type: 2

management plan, stock assessment, and food safety information for the California spiny lobster and 16472, 16584).

- Extension work o Coho salmon led to the removal of in-stream barriers and expansion of their range, as well community participation in stream water conservation measures and contributed to the creation of science-based, sustainable fishery and MPA management plans, as well as the education and involvement of coastal stakeholders in marine science and decision-making.
- Carried out projects to create awareness and partnerships among between fisherman, community members and public officials resulting in opening of the San Diego Dockside Market, initiated by earlier work resulting in direct marketing opportunities for fishermen.
- Through expansion of biotoxin monitoring program to include lobster and crab samples through collaborative fisheries research the California Department of Public Health was able to more finely target advisories, lifting an unnecessary safety advisory and improving fishermen's ability to continue fishing in areas not affected by the toxins.
- Though seafood safety outreach, developing HACCP trainings and guides, multi-lingual outreach materials, webinars and food safety websites developed in collaboration with nation-wide Sea Grant and academic expert's materials have reached more than 400,000 users nationally and internationally.

2015 Performance Review Panel Summary for

Connecticut Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

NSG Funding for the Connecticut program is about \$1,203K for SSSS. About half of CTSG's total budget comes from leveraged funds.

Key science and technology areas include shellfish aquaculture, seaweed based products, integrated aquaculture, and biofuels.

CTSG cites its most significant contribution in the area of seaweed research, which has resulted in scientific advances and commercial applications. It has conducted research on physiology, genetics and culture of seaweed for 30 years. A 122 page on-line manual is being used regionally and internationally.

CTSG research has demonstrated the economic value of nitrogen removal by seaweed, providing kelp farmers another source of income by trading nitrogen credits in the State of Connecticut's program.

CTSG has made significant contributions in a number of areas related to shellfish aquaculture. CTSG worked with regulatory agencies to streamline permitting processes, resulting in a reported 50% reduction in time to obtain a permit. CTSG led development of a comprehensive publication identifying strategies to address aquaculture production hazards, organisms causing aquatic animal and human illness, biofouling and invasive species, and other hazards. CTSG worked over a decade with diverse partners to convince USDA to bring more shellfish aquaculture under its Noninsured Crop Disaster Assistance Program. Effective in December 2014, 45 shellfish and sea vegetable companies in Connecticut and others nationwide were eligible for coverage.

CTSG has active HACCP and other programs promoting seafood safety.

As mentioned under Science and Technology, CTSG made contributions promoting seaweed aquaculture, for example, developing a formula for organic liquid seaweed-based lawn fertilizer, establishing kelp nurseries, and investigating processing options and hazards for a dried sea vegetable product.

Reviewer: Galen Tromble

Reviewer Type: 1

CTSG helped fishermen respond to the collapse of the Long Island Sound lobster fishery, facilitating participation in the Trade Adjustment Assistance program and developing an online course, called "Alternative Enterprises."

CTSG met or exceeded 6 of 10 performance measures. 3 of the missed PMs were due to a single Community Supported Fishery project. The fourth was a PM related to aquaculture permitting time. While CTSG couldn't collect hard data to meet the performance measure, it has anecdotal information that permitting times were significantly reduced. CTSG achieved 5 of 6 program objectives. One objective was reported as missed, but based on the report narrative appears to have in fact been met (USDA modifies eligibility for Noninsured Crop Disaster Assistance Program by 2015).

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DRAFT Rating: 2.5

Program made major contributions to its goal: To contribute to the expansion of environmentally and economically sustainable marine aquaculture industry in CT and the NE

- Development of an MSX disease resistant oyster and Best Management Practices to enhance natural oyster beds
- Development of a user friendly online decision tool used for shellfish site selection and aquaculture management and a comprehensive guide identifying strategies to address operational and environmental production hazards.
- R &D on seaweed culture leading to the development of online training materials a NY commercial operation and development of a nutrient trading program based on research quantifying the bioextraction properties of seaweed
- Provided support to sponsored aquaculture and small scale fisheries efforts in Vietnam, Cambodia , and St. Martin

Program has provided the following major benefits;

- Contributed to growth of CT shellfish production
- Created new businesses and job opportunities through its training and education activities
- Helped reduce time to obtain an aquaculture permit from 6 to 3 months
- Helped obtain eligibility for CT shellfish growers under USDA Non Insured Crop Disaster Assistance Program
- Helped CT lobstermen gain eligibility under the Federal Trade Adjustment Assistance program and provided workshops to help develop new business plans

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Connecticut Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

CTSG refers to itself as a small program but the investment appears to be on the mid to high level? Regardless, because of limitations in funding they have implemented restructuring of the program to optimize the research dollars available. This has included requiring some staff to raise 25% of their salaries from grants and contracts; sharing staff with other CT programs. To their credit they have taken a hard look at the operational structure and implemented changes to optimize their research investment. The CT program is small in the sense that it is almost entirely focused on shellfish aquaculture, that is, oyster and clam aquaculture. Apparently in the late 1990's the industry was devastated by a parasitic disease. Working with state agencies, a disease resistant strain of oyster was developed and has recovered the industry to some extent. Much attention has been focused on the positive impact of reducing nutrients, particularly N, in coastal waters that support shellfish aquaculture. CTSG has identified which algae species are most effective in improving water quality for human public health reasons and to improve the yield of shellfish. The focus of the program by virtue of its focus on shellfish aquaculture is Long Island Sound which it shares with NY. CT and NY appear to have a long standing collaboration working towards better practices for shellfish aquaculture. The program should be congratulated on its taking a hard look at its structure and making changes to optimize its research investment. It should also be recognized for working with NY on shared issues. It appears to have been proactive in working with the industry to solve problems of disease and water quality resulting in solutions that have worked. They have been effective in changing the status of shellfish aquaculture via an act of Congress as a recognized USDA commodity and therefore eligible for federal disaster relief. The result of their research and outreach efforts has been the availability of safer oysters and clams. Interestingly, they have noted that there have been shifts in the distributions of species with cold water species shifting to the north with concomitant increases in warm water species from the south in LIS. This is an interesting observation. How this impacts their fisheries is not known and is worthy of investigation.

As for other oyster aquaculture invested states, the availability of safe shellfish is a significant contribution to society. It is notable however, that while CT collaborates with NY, there doesn't seem to be much collaboration or networking with other oyster aquaculture states such as Louisiana, Texas, MD, RI, ME, Washington. Since there are no metrics that relate to numbers of publications, it is not known how much dissemination of information occurs. It is important for these states to network and transfer

Reviewer: Nancy Thompson

Reviewer Type: 2

technologies when appropriate. A collaboration with MD would be useful for the CT industry and the program. Regardless, the citizens of CT are assured a safe aquaculture shellfish product which is a huge public health benefit. That CTSO took the lead in developing a disease resistant strain of oysters is laudable. It is surprising that working with the NOAA/NMFS Milford Lab is not highlighted. They need to improve their efforts to transfer their lessons learned and technologies and perhaps some informal network for oyster research needs to be established.

2015 Performance Review Panel Summary for

Delaware Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

Program generated more than 1:1 match of federal funds. Program made significant contribution to document value and benefit of shellfish farming to improve water quality and provide new economic development opportunities. Years of effort finally resulted in approval of bottom culture shellfish and SG assistance in developing language for statutory code and regulation for bottom leasing. Research and education created major policy change through new legislation. SG provided leadership and technical guidance. SG research and scientific information is the foundation for HACCP materials and training with DE taking a lead role. SG research developed new bait for conch and eels with less reliance on horseshoe crabs that experienced declines because of their demand for bait. New bait has small amount of male horseshoe crab and resulted in a private company scaling up production for a new proprietary commercial product for public. Example of research findings being commercialized. Program conducted nationwide survey to understand knowledge by the medical community about seafood safety and consumption. Efforts will focus on training for health care providers. Research on subpopulation of important fish found contamination levels vary by life histories. New information will support more accurate fish consumption guidelines. Some ongoing research on pathogen surrogate to improve shellfish safety may improve seafood handling and safety.

CDC reports that Seafood HACCP training has lowered the incidence of food borne illnesses in US. DE plays lead role in training future instructors in US and internationally. SG Coast Day that includes a Crab Cake Cook-Off resulted in winner getting much publicity and increased demand that increased sales more \$100K in one year. Program took lead in national seafood conference, Framing the Message about Seafood, that resulted in consensus on conceptual framework and new web based tool to deliver science-based information to individual consumers about seafood consumption. The site is used by global community and serves as source of information for dietician, journalists and more about health benefits of seafood. Program on oyster gardening and restoration expanded from 13 sites to more than 130 with 150 volunteers that engaged community in supporting the ecological and economic value of robust oyster populations in local bays.

2015 Performance Review Panel Summary for

Delaware Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

A relatively small program that met most of its plan objectives and performance measures. Significant research accomplishments provided a new test to distinguish populations of white perch, development of a new eel bait that is less reliant on female horseshoe crabs, and development of an experimental pathogen surrogate for norovirus contamination in cooked oysters

Program made significant contributions to improve the safety of the national seafood supply, preserving the Horseshoe Crab resource, improving environmental quality of inland bays, establishing a state aquaculture industry, and improving public knowledge on seafood issues. Specific examples:

- Providing direct HACCP training to industry and also to HACCP trainer and seafood inspectors to improve seafood safety at the state national level.
- Helping Delaware establish a bottom leasing program for commercial shellfish aquaculture through education, outreach and technical guidance to the public
- Provided public audiences including educators with seafood related training and education opportunities and web based information to improve knowledge about proper handling techniques and helping consumers make informed decisions on seafood choices
- Helped improve environmental quality of DE inland bays through research, demonstrations and training for volunteer oyster culture and gardening

2015 Performance Review Panel Summary for

Florida Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

Program has developed a new native clam for commercialization to add more product diversity to clam growers resulting in \$400k in new sales. A market analysis with consumers and chefs showed high ratings of acceptance. A new Vibrio monitoring tool was not only developed by accepted by the National Shellfish Sanitation Program reducing labor costs and assay time from days to 24 hours. Valuable coastal restoration plants have been integrated into marine fish recirculation systems to help habitat restoration. These are examples of applied research creating public benefits. Research on sharks resulted in ban on fishing in state waters to conserve tiger and hammerhead sharks. Program showed current harvesting methods for sponges is sustainable and recommended approach retained 150 jobs and \$3M in revenue to save industry from shutdown. Participants in shellfish school learning BMPs reported increased income by \$10,000 from training. Oyster harvesters were able to continue summer harvests because program influence policy change to remove restriction with oyster tongs onboard vessels during certain period.

The program has a leadership and coordinating role in the National Seafood HACCP Alliance for Training and Education that is a signature and premier SG initiative in collaboration with FDA and AFDO. Training and educational materials are developed for use in a global network program across 28 countries. The training meets FDA requirements for seafood companies and importers to market fish and fishery products in the US. Program has trained all FDA inspectors and most of state inspectors. It is a great success story that has reduced food borne illness by about one-half and is cited by CDC as big factor in this trend. Program responded to new FDA actions to reduce *V. vulnificus* to non-detectable levels with a video training program on processing, handling and transportation practices that meets FDA reduction program and keeps more than 1500 commercial fishermen and dealers in business. Testimonial on training of educators and law enforcement in methods to advance public compliance with fisheries regulations commends linkage between local communities and state and federal agencies. Program is active with science-based assistance to sustain system of artificial reefs that contribute \$millions annually to local economies. Program hosts schools on shrimp, oysters and other seafood products for professionals in seafood industry. Training resulted in more than 500 processing companies adopted safe and effective seafood handling and processing methods. Efforts also included assistance to China that now adopted HACCP guidelines and is major exporter of seafood to US and globally. Program assisted with USDA TAAF program that benefited 150 commercial fishermen with \$1.5M payments.

Reviewer: Gary Jensen

Reviewer Type: 1

Program responded to Deepwater oil spill with a decision support framework to help affected businesses and residents file claims for lost revenue. They trained boat owners to join BP program to collect oil and earn revenue over \$2M. About 1,000 residents received training to become BP Qualified Community Responders to address tar ball issues. An oil spill contingency plan was developed and approved by Unified Command and seafood sensory program trained regulators and others to detect oil contamination in seafood. Marine education and outreach program provided learning experiences for 700 teachers, 10,000 youth and 6,000 residents and community enhanced more than 128,000 acres of critical coastal habitat.

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Florida Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Florida Sea Grant received \$3,633K in SSSS funding from the national program, making it the 3rd largest program.

FLSG research has developed clam culture methods and technologies, including work in developing sunray venus clams as a new aquaculture species ideal for Florida. There

already is a \$400,000 increase in income from sales of Sunray Venus Clam and 24 new industry jobs.

FLSG obtained a \$4.7M grant to do experimental work on oyster reef restoration, that has led to an additional \$11M in funding to support restoration of reefs.

FLSG research developed a new tool to monitor Vibrio in oysters. The Vibrio monitoring tool was accepted as an emerging method by the National Shellfish Sanitation Program. It reduces labor costs and assay time from 45 days to just 24 hours.

FLSG researchers developed a recirculating system that can be used to grow marine plants using effluent from aquaculture operations. Over 100,000 plants have been grown and used to enhance over 300 acres of coastal habitat.

Leslie Sturmer, Florida Sea Grant's aquaculture specialist, received a 2015 Distinguished Service Award from the U.S. chapter of the World Aquaculture Society.

The Seafood HACCP Alliance has been one of Sea Grant's most successful extension efforts.

Alliance certification courses annually train more than 2000 individuals, and to date have graduated more than 35,000 participants from 28 nations. The training also supports the commercial viability of 5,400 seafood firms in the US and US territories. Official training curricula has been developed in English and Spanish; the materials have been translated into more than 10 other languages. [National and International impact]

Reviewer: Galen Tromble

Reviewer Type: 2

FLSG helped develop the Teach Aquaculture curriculum that advances STEM literacy in failing schools and introduces students to career opportunities. “Teach Aquaculture” consists of eight learning modules with 24 activities appropriate for middle and high school teachers.

The “Teach Aquaculture” website, where the materials can be downloaded, has registered more than 800 users from 43 states and 5 foreign countries. The team has conducted in-service workshops for more than 90 middle and high school teachers. In addition, 25 teachers participated in a specially designed week-long training for novice aquaculture educators.

In 2013, FLSG and people recruited from the Apalachicola Bay Seafood Workers Association created a web-based training course that could be given online or in-person. In the latest training period, 2,118 shellfish harvesters and dealers have been trained and are eligible for licensing.

FLSG helps advance public understanding of safe, healthy seafood choices. In 2011, FLSG joined with five other Sea Grant programs to create the Seafood Health Facts website, a comprehensive resource for healthcare providers and practitioners, and their patients on seafood nutrition and safety. The site receives more than 45,000 page views monthly. In addition, FLSG developed “brown bag” webinar sessions to target professionals at partner agencies and NGOs on the safety and sustainability of Florida seafood. The 16 webinars produced were viewed by nearly 600 individuals.

FLSG plays an important role in the state's artificial reef program, that contributes hundreds of millions of dollars to Florida's economy and supports 2,600 jobs in southwest Florida alone.

FLSG met or exceeded 9 of 9 performance measures, and achieved 7 of 7 program objectives.

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Georgia Sea Grant

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DRAFT Rating: 2

Overall, the SSS combined work broadly and satisfactorily addressed the three program goals. Ten impacts and 20 accomplishments were described. The summary report was well written to show that the work was substantial, comprehensive and seemingly well-integrated. The new integrated Sea Grant management structure should be very helpful in further integrating research and advisory services in the future. A nice blend of impacts and accomplishments were shown. Performance measures were measurable and mostly achieved, however I would have liked to see a reason or status report for the four or five PMs that were not achieved.

S & T impacts and accomplishments were largely in the form of practical technology development as opposed to scientific advancement. New technologies or techniques were developed that helped the fishing industry including a terrapin excluder for crab traps and development and NMFS certification of a new TED, "the Boone Big Boy."

As a result of Georgia Sea Grant research, the Georgia DNR reduced the minimum size limit for commercial oyster harvest from three to two inches. This change removes a hurdle for Georgia shellfish growers and enables a significant increase in the production of oysters for the single shell, "cocktail" market.

The program has extensive reach in the state of Georgia to the entire seafood industry, including consumers, and most of impacts occur at the state and local levels. The gear audits and technical training at the Brunswick Center involving 173 fishermen have obvious, but difficult to document benefits. An obvious impact is that through Trade Adjustment Assistance training, 120 shrimpers not only improved their business plans, but were also eligible for a \$12,000 payment from the TAA. The program also developed and delivered over 300 terrapin excluders thus aiding the commercial crab catch.

GASG has also helped to rekindle the oyster industry in the state through SG research that showed how to grow a "single" oyster and three new oyster growers were bringing limited numbers of "single" oysters to market, with one grower reporting revenue of \$40K from a pilot project. In addition, SG research demonstrated a rapid grow out cycle for oysters in the state which led to Georgia DNR reducing the minimum size limit for commercial oyster harvest from three to two inches which removed a hurdle

Reviewer: Jim Murray

Reviewer Type: 1

for Georgia shellfish growers and enables a significant increase in the production of oysters for the single shell, "cocktail" market.

GASG continues to be a leader in HACCP training, certifying about around 80 HACCP professionals a year, 206 in the review period, thus enabling approximately 200 Georgia seafood processors and dealers and 148 retailers to operate. *Vibrio vulnificus* programming led to increased awareness such that two commercial fishermen claimed their lives were saved after their boat exploded and they were potentially exposed to *Vibrio*.

Routine sampling discovered PCB poisoning in blue crabs near a superfund site and GASG reported the contamination to the GA DNR, which ultimately banned fishing near the LCP site.

A new mercury testing program has had a national and international benefit by serving 1691 participants from 502 cities in 40 states in the U.S. Internationally, the service has helped participants in 14 additional countries.

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DRAFT Rating: 2

GASG has integrated extension and outreach into its research component from the earliest phase in proposals, ensuring that all its research is relevant, applicable, and applied to GASG priority areas. It is evident that GASG has taken the opportunity to return its program during this rebuilding phase, and utilized this opportunity to ensure that its research and extension components are fully integrated. This has extended the depth and scope of outreach on state and regional levels. GASG has conducted research in the shrimping industry with its unique capability and RV Georgia Bulldog, which have lead to direct approval of new TED designs. This has potential impacts not just in the local and state economy but in shrimps across the Atlantic and Gulf of Mexico. Other research has been conducted through demonstration farms for aquaculture, and several research projects have established pilot programs with methods directly transferable to industry in the shellfish arena. Looking at various shellfish species, shellfish and aquaculture research and advancement in techniques and technologies have developed a replicable formula for impactful research including growers and extension components, beyond initial conceptualization. Theses impacts will be felt immediately in the local and state area, but could easily be extended regionally, nationally, and internationally to other shellfish growers.

As previously mentioned, GASG has done an impressive job of integrating its research and extension components, ensuring that its research is implemented and applied. GASG has conducted a number of outreach and education programs directly supporting commercial fishermen in the state, including training on permitting and identification, new technologies, and assisting with applications for federal aid through the Trade Adjustment Assistance program. In these ways, it has shown its ability to meet unmet needs which partners in academia and state and federal agencies are unable to provide. Education programs on seafood pathogens and training for state agencies and fishermen has demonstrated its lasting impact through application, particularly the fishermen who retained knowledge on Vv wound infections. Additionally, local response to PCP contamination in blue crabs and training at the local level demonstrated nimbleness of the program addressing immediate concerns before GA DNR could react. Mercury contamination programs have demonstrated not only nationwide but international impact, with 100% of participants showing decreasing mercury levels and continued support for participants until mercury levels reach acceptable range. By tying extension efforts directly to the research program, GASG has limited its sphere of influence, but provided more impactful research and support of industry in a few specific topic areas.

2015 Performance Review Panel Summary for

Georgia Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Georgia Sea Grant received \$1,129K from the national program for SSSS.

GASG led a regional effort to create the South Atlantic Regional Research Plan aligned with the priorities of the Governors' South Atlantic Alliance.

GASG research improved TED design for the shrimp fishery, and developed terrapin excluders for crab pots.

GASG research developed a new method for oyster culture that led to three aquaculture businesses starting up, using the new method.

GASG research led to managers reducing the size limit for commercial oyster harvest, opening new opportunities to produce oysters for the single shell "cocktail oyster" market.

The scope of GASG research is primarily state and regional.

GASG work has benefited the fishing industry, by working with shrimp industry on properly using turtle and fish excluder devices, providing hands-on technical training to assist fishermen, Trade Adjustment Assistance training for shrimpers, and delivering 800 terrapin excluders for crab pots.

GASG developed a program to measure mercury levels from hair samples that can be mailed in. Originally intended to serve women in Georgia, the program has served 1,691 participants in 40 states and 14 countries. Participants with high levels receive free re-testing and personalized information. The program has helped give pregnant women and nursing mothers confidence about eating seafood.

GASG's marine advisory program has reached hundreds of students, providing information and experiences to increase ocean literacy.

GASG met or exceeded 6 of 7 performance measures, and achieved 12 of 16 program objectives.

2015 Performance Review Panel Summary for

Hawaii Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

One major initiative has centered on restoration of native HI fish ponds. Program has helped with critical permitting approval to repair seawall for pond to operate and collected baseline water quality and nutrient data to aid in management and health assessment for aquaculture use. A full time coordinator was hired but role is uncertain. This is ongoing work and ponds are limited but a model is being established for restoration. It is a community-based example. Another ongoing and long-term effort has resulted in groundwork for new shellfish sector in HI. Program was instrumental in testing biologic and economic feasibilities for growing bivalves and ensure harvest waters met FDA requirements. A major obstacle was overcome with state training staff to classify shellfish growing areas. These combined efforts resulted in two private shellfish operations and a private hatchery to provide shellfish spat locally and to West coast. Research has supported more efficient aquaponic systems with increased total sales reaching \$5K but no average data per system.

The development of new shellfish sector and operation of shellfish hatchery has aided West coast shellfish growers with spat and larvae during times of critical shortages to sustain their businesses. The program has assisted communities and families with low cost backyard aquaponic systems to provide fresh food and some economic opportunities. There have been some larger scale commercial operations but there is no data on estimated value of sales or impact. Educational efforts have extended to some local schools in Maui. Work in American Samoa resulted in new fish feed production equipment and donated fish meal from tuna fishery to support local fish farmers. There are no data on number of farms or economic impact of these actions. A first time project after 20 years of community effort resulted in rules for a community-based subsistence fishing area as a model for co-management of local fisheries. Public outreach included a TV show, Voice of the Sea, that received numerous awards. Program took charge of developing a regional research needs report submitted to NOAA and state to update its Ocean Resources Management Plan.

2015 Performance Review Panel Summary for

Hawaii Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

During the review period, HISG invested \$1,340,628 in the SSSS focus area. It was stated that 125 peer-reviewed publications were produced in prestigious journals, but it is not clear how many of those were in the SSSS focus area. Twelve impacts and four accomplishments were described. All of HISG's program objectives were met with the aquaculture training component being greatly exceeded. In the program objectives discussion, there was a comment "based on the results of the 2012 PRP review by the National Sea Grant Office, UH Sea Grant administration has decided to discontinue its efforts associated with the Safe and Sustainable Seafood Supply focus area in 2013 so it can focus its limited resources on other higher priority initiatives and issues in the state.

The revamped HISG's Center of Excellence for Sustainable Aquaculture and Fisheries provides a concentrated set of physical facilities which is highly leveraged to support the emerging aquaculture industry in Hawaii," which suggests that HISG is eliminating this focus area in the future.

The revamped HISG's Center of Excellence for Sustainable Aquaculture and Fisheries provides a concentrated set of physical facilities which is highly leveraged to support the emerging aquaculture industry in Hawaii.

Most of the impacts from HISG's SSSS program related to societal impacts as opposed to impacts in the area of Science and Technology which as described were few.

An economic feasibility study examined the bivalve market in Hawaii, and successful grow out trials were carried out in three traditional Hawaiian fishponds which showed that market size oysters can be produced in 5-6 months as compared to 2-3 years at mainland sites. These results allowed DOH to prioritize its support for developing this new industry for Hawai'i. The DOH subsequently trained its personnel in the process of classifying shellfish growing areas. In 2013, DOH approved two private operations.

There were numerous and examples of important impacts being provided to various constituencies in the state of Hawaii. At the national level, HISG supported Northwest oyster farmers for who were hit hard by the scarcity of oyster seed brought on by ocean acidification. Production has totaled \$148,781 and produced nearly 21,518 million spat and 3,610 million larvae. This seed is provided to approximately twelve farms on the West Coast and three in Hawai'i. The CSAF is largely student operated with 25-30

Reviewer: Jim Murray

Reviewer Type: 2

employed each year which provides income for the students to support their studies and valuable hands-on training.

There are now more than 20 new aquaponics systems on Maui, including three commercial systems.

In American Samoa, the purchase of larger feed equipment, along with the donated fishmeal that is mixed with a vitamin and mineral supplement to enhance the nutritional content of the fishmeal, has helped to expand the aquaculture industry.

The state's Board of Land and Natural Resources unanimously approved the community-generated rules for a designated Community-based Subsistence Fishing Area in October 2014, making it the first of its kind in the state. These rules were the culmination of 20 years of community effort, over 60 public/community meetings, 15 separate rules drafts, 40 community interviews, and seven scientific studies. They rules also serve as a framework for 10 other Hawaii communities statewide who are seeking to propose similar rules packages that protect their nearshore fisheries for subsistence harvesting.

HISG has made good use of the media with Voice of the Seas producing nineteen new online episodes and 33 reruns aired this past year and winning 6 Telly awards for their efforts.

A collective of community groups, individual landowners, and practitioners from across the main Hawaiian islands leveraged previous and current support from UH Sea Grant to obtain foundational funding in support of a full time coordinator for the fishpond group.

HISG led the effort to establish a commercial bivalve industry in Hawaii. In 2013, the Hawaii Department of Health approved two operations, one on Kauai and the other on Oahu, to sell shellfish to the public. Two other shellfish farms are pending approval.

Hawaii Sea Grant partnered with the college in Samoa to offer a training course that produces 12 participants who are versed in underwater surveying and are pursuing educational and employment opportunities in marine resource management. Many of these students are now supporting NOAA programs.

2015 Performance Review Panel Summary for

Illinois-Indiana Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

With a relatively small percentage (10%) of an already modest annual budget (\$3.3 M), The program is making contributions through technical and business process support of aquaculture of cool-water spp. and providing seafood consumption advisories to the people of the southern Lake Michigan region. The primary contributions of the program to science and technology in the SSSS focus area flow from the eight research projects funded by the IISG program. These projects were focused on information needs for aquaculture marketing and seafood consumption outreach and education initiatives. The majority of their efforts focus on building marketing/financial tools and increasing the aquaculture industry market share. For example, the study areas include research on consumer preference and willingness to buy fresh locally produced fish-on-ice, in lieu of low cost imported and processed seafood products from abroad. The study results have assisted producers and retailers in tailoring their marketing and sales operations to meet existing demand and effectively compete with imports. In addition, IISG funded research as diverse as Great Lakes food web characterization, assessment and trophic transfer of contaminants in resident fishes, and the development of an on-line, real time databases and publicly-accessible fish consumption advisories. IISG supports research, develops information products, provides outreach to diverse stakeholders, and facilitates the incorporation of that knowledge into resource management, business decision-making processes, public health and seafood safety across the region. The impacts of the program are primarily regional, with international technology transfer projects in Ghana and Kenya featuring sustainable aquaculture practices implemented using environmental best practices.

Removed from the typical coastal marine resources setting, the size and scope of the program is relatively small at this time, but the potential regional demand for aquaculture products could increase significantly if further facilitated. IISG is also attempting to create partnerships among aquaculturists and local agricultural producers to develop low-cost feed sources. The contributions of the program are significant, and the progress in expanding aquaculture in this unlikely setting are impressive as depicted in the PIER report and performance measures, given the relatively small investments.

One apparently missing component of the sustainable aquaculture effort is the explicit inclusion of environmental impacts minimization techniques/training. In fact, the only mention of environmental impacts, the development and use of best management practices, and avoidance and minimization was in the international project description.

Generally, the program performance measures and reporting were incomplete, and/or difficult to evaluate. This may have been due to the format provided, but some measures were not well explained and the reported values not supported by narratives. Without validation and explanation - these values were not useful. However, based on the PIER report narratives and the Program Objectives table, it seems the IISG program did meet or exceed most of their objectives. The program strategic plan was well conceived and the objectives identified were achievable given the relatively modest size of the investment.

The primary SSSS focus is on building safe, sustainable aquaculture production and sales in the region. The information, education-outreach, and decision-support tools developed have been used effectively to inform industry stakeholders, resource managers, and the public. Aquaculture industry recipients have benefited the most in terms of technical and business process support. The aquaculture industry in Indiana alone grew 3-fold in ten years, and is adding new businesses and jobs. Information re: Illinois aquaculture seemingly not reported.

IISG has provided Indiana residents with Fish consumption Advisories (no explicit mention of Illinois), potentially improving consumer decisions. In addition, research of consumer preferences and willingness to pay a premium for local, fresh frozen seafood informed seafood producers, distributors, marketers and restaurants provided the industry the knowledge and incentive to grow their market share and profitability. There is no readily available information as to the extension/technical support for process efficiencies, productivity increases, etc.

Management of natural resources in the area was not specifically addressed in the reporting of the SSSS activities. As mentioned above, the sustainability/environmental best management practices message is not coming through in the program description. This is a missed opportunity to develop and demonstrate best management practices.

2015 Performance Review Panel Summary for

Illinois-Indiana Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

A very small program (\$80K in SG funds) consisting primarily of an aquaculture marketing specialist focused on expanding aquaculture production in member states and Aquatic Ecology and Education Specialists improving the quality and availability of information on seafood safety information to consumers in Illinois and Indiana. Research focused on studies to assist aquaculture companies to identify market opportunities for fresh shrimp and tilapia. The area of impact was primarily Ill and Ind with one project funded by AID to provide assistance in Ghana and Kenya to develop baitfish and food fish businesses and a redesigned AquaNIC website providing aquaculture information resources to an international audience. Extension efforts provided new business tools, workshops training, and one on one advice to potential and current aquaculture producers

Considering the small program size extension efforts helped achieve significant benefits including:

- A fivefold increase in the value of aquaculture sales in Indiana.
- Technical information provided to lending agencies resulted in financing to 3 aquaculture operations in Indiana,
- Studies and workshops market opportunities for fresh as opposed to frozen shrimp and tilapia have led to new production in both.
- Development of an online real time data base will help recreational and subsistence fishermen and their families have better information and improved access to health risks posed by consumption of fish taken from specific Indiana counties and bodies of water

2015 Performance Review Panel Summary for

Louisiana Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

SSSS funding for the Louisiana program is about \$2,221K.

LASG cited several science and technology contributions in their report. One was completion, in 2012, of a research facility to support the alligator industry. Another was research on safe harbor options for commercial fishermen to make the industry more resilient to major storms. A third project, with potential impact across the Gulf and Atlantic coast regions, is research on developing an alternative blue crab bait from seafood processing waste.

LASG partners with the other Gulf of Mexico states to leverage more than \$10M of regional research and outreach funds. The impact of the Deepwater Horizon oil spill in 2010 continues to drive much research spending in the Gulf.

LASG developed a coupled model for hydrodynamics, water quality and oyster production to examine the effects of freshwater diversion and sea level rise.

LASG research showed that suspending oysters off-bottom decreased pathogenic *Vibrio* bacteria and could reduce human illness from consumption of raw oysters.

Based on the report, LASG appears to focus more resources on extension and outreach compared to research. Impacts are mainly state and regional.

A number of LASG projects related to local seafood, direct marketing, and LA seafood promotion. LASG has been successful and instrumental in development of the Louisiana Direct Seafood program, the Louisiana Wild Certified Seafood Program, Sea to Table consumer education, and local value-added branding such as the "Vermillion Bay Sweet" shrimp brand, that has resulted in higher prices to fishermen for premium product.

LASG contributes to seafood safety by conducting HACCP training and Sanitation Control Principles courses.

Reviewer: Galen Tromble

Reviewer Type: 1

LASG assists the commercial fishing industry through projects including development and distribution of fast growing and disease-resistant oysters, the Louisiana Fisheries Forward professionalism training program for fishermen, and native language outreach to Vietnamese speaking fishermen, who comprise 40% of the fleet.

LASG worked with the other Gulf States on programs responding to the 2010 Deepwater Horizon oil spill, bringing tools and services like the Coastal Community Resilience Index, peer-listening training, and seafood safety and sustainability training to more than 72 communities across the region. In 2014, two new regional activities began, bringing in a combined \$1.5M in funding: an oil spill outreach program, and partnering on NOAA's sentinel site program in the Gulf.

LASG met 2 of 3 performance measures. LASG achieved 24 of 28 program objectives.

2015 Performance Review Panel Summary for

Louisiana Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Many program accomplishments have been achieved with external funding which have resulted from program leadership with other GOM programs to build a regional research and outreach portfolio totaling over \$10 million between 2007-13 in response to hurricane and oil spill impacts. These activities included a wide range of training and education activities to improve harvesting, processing, marketing, and seafood safety and handling practices. It was difficult to distinguish the role of SG and other funds in these activities. Major contributions included;

- A modeling study to enhance understanding of the impacts of sea level rise and fresh water diversion on oyster growth and survival
- Sponsored research demonstrating reduction of dangerous vibrio through off bottom oyster culture
- Development and testing of an alternative crab bait from shrimp processing waste to replace reliance on Atlantic menhaden
- Development of an Alligator Research Facility that has tested substitution of plant based to animal based proteins in feeding trails

Program has provided the following major benefits;

Though its research extension and outreach efforts, program has provided significant assistance to harvesting, processing, marketing, and aquaculture sectors of the LA seafood industry in recovering from the impacts of Hurricanes and the Deepwater Horizon Oil spill.

Program impacts include:

- Reported economic and non-market benefits of over \$235 million compared to target of \$ 8 million

Reviewer: Bruce Morehead

Reviewer Type: 2

- 8,224 fishermen, resource managers, and seafood businesses who adopt and implement responsible harvesting and processing techniques and practices compared to a target of 200.
- 16,940 LA producers distributors, and consumers of seafood that modified their practices using knowledge gained in fishery sustainability, seafood safety, seafood health benefits, although target was 200,00.

All performance measures were linked to the Trade Adjustment Program although many other training and education activities contributed to these measures.

2015 Performance Review Panel Summary for

Louisiana Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

LASG's focus in research and technology primarily focuses on tradition fisheries such as shrimp and blue crab, but has also expanded on alternatives including alligator. Research initiatives directly supporting the commercial fisheries and aquaculture industry are well integrated with extension components working to transition research to management and transfer technology to fisheries operations, however there is not as much emphasis on consumers and consumer choice. Research developing alternative blue crab baits from shrimp waste has significant potential to create cost-savings in the fishery while creating an additional revenue stream within the shrimp industry and using waste. This research conducted directly by LSG has direct implications for the blue crab industry, and also conservation of the gulf and Atlantic menhaden fisheries. LASG has also created the first facility for alligator farming research, and by establishing a facility mimicking those at a commercial farm, which will support developments in the industry such as economy of feed that is easily transferred to alligator farm operations. LSG is partnering with other Gulf states to establish the Gulf of Mexico Marine Research Institute, to set research priorities and leverage funding. Given the shared issues between these states, this initiative should be looked at as bolstering rather than diminishing the work of LSG, as it will enable future research to be more directed with greater funds. Given LSG's budget, which is significant but also the challenges faced over the last decade and 5 years, LSG's accomplishments are well met with their priority areas and LSG has been smart to prioritize research that is directly applicable to important commercial fisheries and helps them to be reestablished.

Since 2005 LASG has face significant challenges in the areas of safe and sustainable seafood, both in response to loss of the fishing fleet following hurricanes Katrina and Rita, and in the wake of the 2010 DWH oil spill. LASG has provided significant support for fisheries outside of science and technology, with numerous trainings and assistance with federal aid for fishermen. For example, it has supported trainings for shrimps to qualify for Trade Adjustment Act funding and supported establishment of Direct Marketing for Louisiana seafoods, increasing income for participating commercial fishermen and the hiring of an extension agent fluent in Vietnamese. While most of the emphasis has been on working with fisheries directly, LSG has also extended its influence to the consumer both through partnership with Whole Foods to reach consumers directly. LSG has provided dedicated programs and support to help reestablish LA commercial fisheries and to increase profitability in the industry following significant

Reviewer: Megan Mueller

Reviewer Type: 2

market obstacles. Next steps should continue this trend, but also place more emphasis on consumers to bolster the newly reestablished fisheries.

2015 Performance Review Panel Summary for

Maine Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Maine Sea Grant receives \$3,213K from the national program for SSSS, making it the 4th largest program.

Key research areas include fisheries science and management, aquaculture, and fishing safety.

In fisheries management, MESH focuses on fisheries managed at the state and/or community level. The American Lobster Settlement Index, developed by MESH researches 25 years ago, is used in the U.S. and Canada to assess and manage the lobster stock. Recent work has created a web portal for data viewing and a forecasting tool. In 2012, MESH organized an International Symposium on the American Lobster, leading to a special issue of the Canadian Journal of Fisheries and Aquatic Sciences.

Maine has 11 species of diadromous fish, and is a leader in restoring habitat for migratory fish, including Atlantic salmon. MESH work enabled a statewide assessment of rainbow smelt, and a ME study of dam removal in a Penobscot River tributary has been used throughout the state and nationally.

MESH conducts significant research in seaweed aquaculture and shellfish aquaculture, including development of new culture techniques and target species.

MESH researches studied four Maine fishing communities, developed qualitative indicators of social resilience, and documented traditional fishing knowledge, to help fishery managers understand the impact of regulations.

MESH research has impacts at the state, regional and national/international levels.

MESH has helped lead efforts to maintain and protect working waterfronts, helping to create the National Working Waterfront Network, and working with partners to develop a Sustainable Working Waterfronts Toolkit.

MESH provides diversification and business training, leading implementation of the USDA Trade Adjustment Assistance Program for the lobster fishery, in conjunction with four other NE states, and developed a 12 week aquaculture training program for commercial fishermen interested in business diversification. In a more novel approach, MESH has explored ways that fishermen can diversify into tourism, and conducted workshops and developed fact sheets and web content.

Reviewer: Galen Tromble

Reviewer Type: 1

MESG has supported efforts in Community Supported Fisheries (CSF), participating in the National Summit on CSFs organized by New Hampshire Sea Grant, and developed the Maine Seafood Guide to provide information on nearly 40 species.

MESG has been In the last five years, MESG has revived and expanded the Downeast Fisheries Trail, a fishing heritage education and tourism initiative with 45 sites in eastern Maine.

MESG met 2 of 2 program performance measures, and 3 of 3 program objectives. The number of both performance measures and program objectives is very small compared to other programs

2015 Performance Review Panel Summary for

Maine Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

MESG has accomplished a great deal in research for fisheries management, and has a budget to substantiate significant accomplishment. The program has supported diversification of fisheries through supporting research, and directly targets research that can be applied at the local and state level and where local fishermen can become involved in the science and management. Significant research contributions are evident related to diadromous species, of which MESG is a leader and has lead workshops on Atlantic salmon and endangered species habitat restoration. The program has also advanced significant contributions in developing capacities for algae aquaculture, including basic research needed to establish the industry and hiring of a dedicated extension agent. MESG is targeting research in a few specific areas with the greatest impact on ME commercial fisheries and potential growth sectors in aquaculture. MESG has many publications demonstrating its advancements in marine science and aquaculture technologies, and has selected initially projects that are local and regional in scope but that also have ongoing potential to be applied and expanded. For example, many aquaculture techniques, particularly for algae and microalgae could be utilized by industry in other areas. Given the substantial size of the MESG budget, these contributions are in line with what might be expected.

MESG has supported traditional commercial fisheries and fishing communities, and sought means of income diversification and business development training. MESG has multiple successes of sustaining and creating businesses, and cites the creation of multiple aquaculture and seaweed farming businesses directly related to its investments in these areas (such as the 12-week aquaculture training for commercial fishermen). It has also been a leader in protection of working waterfronts, leading symposia and assisting with the development of the working waterfront toolkit with other SG programs. Along with many other SG programs, MESG has played a role in assistance with Trade Adjustment Assistance programs, in this instance for the NE lobster fishery. Even with those programs where MESG provides only a coordinating role or networking, the initiatives MESG supports are directly aligned with its direct investments, activities, and priorities.

2015 Performance Review Panel Summary for

Maine Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

This is an interesting program which focuses on lobster which has become the single most dominant fishery in Maine coastal waters. So this focus appears to be appropriate. MESHG has been involved in trying to establish and support research in aquaculture (shellfish and seaweed or sea vegetables, mussels) to attempt to diversify the fishery portfolio for the state. MESHG is also attempting to recover the commercial wild scallop industry with encouraging results. MESHG appears to invest considerable resources in research which are published. Each objective and project has produced a number of publications and reports which is impressive. One effort is particularly notable and that is the establishment of the Downeast Fisheries Trail which links 45 sites, museums to fish weirs and diadromous fish sites, to describe the importance and history of fishing and fisheries to the Maine economy. This is a particularly innovative approach to eco tourism which apparently is a significant part of the Maine economy. MESHG is a very large program that has considerable funding available. Thus, the program has a lot of resources to apply to sustaining the iconic lobster fishery while assisting with the expansion of new markets and products particularly from aquaculture. Maine's ocean economy, which includes coastal and marine-related industry and tourism, contributed more than \$2.4 billion to the state's GDP in 2012. Therefore the investments of MESHG are appropriate. As performance measures they note that they assisted in the establishment of 1 new lobster pounding business, 5 new seaweed farms, 6 shellfish aquaculture businesses and in effecting the sustainability of 1 international salmon aquaculture company, 3 seaweed farms, 10 shellfish aquaculture businesses, 12 independent fishermen retained through fisheries/aquaculture income diversification and 130 lobster fishing families estimated to have stayed in business as a result of the Trade Adjustment Assistance Program. While these numbers do not seem impressive they have been able to help fishermen stay in business. Interestingly there is no mention of fishing cooperatives or the trend in Maine fisheries to eliminate processors and distributors with the fishermen engaging in this themselves. This effort seems to be a more viable solution to sustaining fisheries in Maine, controlling fishing effort rather than attempting to resurrect latent fisheries (scallops, ground fish, diadromous fisheries). Given how much funding the program receives, there needs to be a hard look at the real priorities to sustain the most valuable fisheries. And a hard look at the potential impacts of climate change on the lobster fisheries and yield/productivity. Interestingly they have a program to educate fishermen regarding safety. This is an important effort however according to Maine Sea Grant, some regulations have increased the risk to fishermen. If this is so, then it seems like working with the state and NMFS to identify those regulations that increase risk should be identified and mitigated somehow. There seems to be an aversion to

Reviewer: Nancy Thompson

Reviewer Type: 2

conducting research that can result in informing assessments of stock condition and status and forecasts in the context of climate change. As far as I can tell, MESG will continue to invest in establishing new fisheries both wild and aquaculture while trying hard to sustain the lobster fishery in the face of climate change and disease. None of these may be possible due to market forces; supply and demand of fisheries products. I suspect the overriding context for all of this is the decline in the overall contribution of fishing to the states GSP. In light of this, and the development of niche markets for its US product, there may be some hope other than for lobster.

There is no question that the program is investing in recovery of old fisheries; expanding latent fisheries; and sustaining the lobster fishery. For Maine, this is a significant contribution to those who make a living off of living marine resources. The establishment of the Downeast Fisheries Trail is significant in that it provides the state the opportunity to show off its fishing history. This type of ecotourism may be the best opportunity for Maine fisheries by increasing interest in expanding into aquaculture in particular. Investments to determine how best to improve the economic and social integrity and resilience of coastal communities are well intentioned. With such a large percentage of communities dependent on marine resources, Maine Sea Grant focused efforts to protect working waterfront assets and access to the shoreline. A National Working Waterfront Network was established and spearheaded by Maine SG and with Florida, Virginia and NOAA and other partners entered into a \$533K cooperative agreement and developed a Working Waterfronts Toolkit. This is a worthy effort to preserve coastal communities and preserve their way of life., These working waterfront efforts have also influenced legislation at the state and federal level. To assist in the retraining of commercial fishermen, MESG developed a 12-week aquaculture curriculum.

2015 Performance Review Panel Summary for

Maine Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Under SSSS, MITSG states its goal is "to guarantee a sustainable supply of safe seafood that meets public demand at an affordable price". To meet this goal, they state the following objectives: 1) develop and disseminate essential knowledge about natural and human threats to

the long-term viability of wild fish populations 2) identify ways to minimize these threats 3) use ecosystem-based fisheries management and other innovative approaches to

accomplish this 3) mitigate impacts of invasive species in ways that are consistent with national objectives 4) building on the leadership role Sea Grant plays in this area 5) enhance management and productivity of wild fisheries in the Northeast region 5) offer training, technical assistance, and outreach programs on standards for

minimizing release of live seafood and the unregulated introduction of non-native species. For the most part they have achieved this goal through meeting the stated objectives. Primarily investing in research and utilizing the network of universities in Mass. and including WHOI, the research they have conducted and or funded has had a direct impact on the management of fisheries. This appears to be one of the few programs that does not shy away from controversial fisheries management issues in New England and works with NOAA/NMFS, Atlantic States Marine Fisheries Commission and the states fisheries departments to provide science advice to better manage fisheries. They need to be recognized for these efforts. For example, their identification of a non native sea squirt and potential impacts on the scallop industry resulted in the NEFMC establishing research set aside (that is catch that is available for research) priority to determine impacts on scallop yield. They worked with a receptive ground fish fishing organization to establish a catch to consumer business model which eliminates the middle men of processor and distributor and integrates all of the industry functions within the fishing organization which can maximize profits for the fishermen and provides a higher quality product to the consumer. This model needs to be applied throughout New England if their fish based fisheries are to survive. This is a highly touted model but not without controversy. The impact of their program has been at the local, state and regional level. Their research results however, can be transferred nationally and internationally. Given the funding provided, and the funding leveraged, which is quite considerable, this is a successful program that is not afraid to tackle hard and controversial issues and provide science advice or tools that can be directly integrated into management.

There is no question that this program has made and will continue to make a significant contribution to society. Unlike other programs in New England, MITSG has identified and focused their research, education and outreach on hard problems with the goal of guaranteeing safe and sustainable seafood to an informed public. It is also worth mentioning that their documents are very readable unlike those from other programs and it is easy to go between their strategic plan and their PIER to determine what was accomplished under their SSSS goal and objectives. Much has been accomplished and much has been directly integrated into fisheries management. They are directly involved in management by participating in various committees both advisory and in crafty management strategies for the New England Fishery Management Council and Atlantic States Marine Fisheries Commission. That these bodies have sought out this expertise is laudable. The Gulf of Maine Regional Ocean Plan identifies research on the potential impact of invasive species on fisheries resources. The MITSG response was to develop a tool to map and visualize the presence and distribution of an invasive tunicate and recognized that it could have negative impacts on the lucrative scallop industry. Their research resulted in establishing this potential impact as a high research priority for the NEFMC and the ASMFC. MITSG is working to develop metrics for success of catch shares programs which remain controversial. Unintended negative consequences from these programs can have far reaching and long term impacts on the fisheries and community stability and integrity. Dealing with this highly controversial management approach head on is both unusual and gutsy. And MITSG is more likely to be perceived by fishermen as a neutral participant in this evaluation. MITSG and other SG programs worked with lobster fishermen to establish a Trade Adjustment Agreement to mitigate the impact of low priced foreign lobsters and stabilize prices for the US fishery and helped save much of this iconic New England fishery. In these ways, MITSG helps communities and local fishermen preserve their culture and way of life. The development of tools to characterize the deep sea soundscape is interesting and could have implications relative to animals that utilize sound for communication. So I would let this play out as it could have direct impacts on e.g. marine mammals. Interestingly, and based on available expertise, they have also developed deep sea tools to characterize deep sea corals, again of increasing interest and controversy to fishery management agencies. In addition, their research on identifying bioindicators of coral health will have far reaching (national and international) application. There is considerable attention and concern focused on the health of coral reefs, as resources themselves, and as supporting habitat for fishery resources. The economic impact of coral reefs, for ecotourism, is in the billions of dollars in the US alone and the attention to corals is appropriate. Healthy coral reefs attract fishers, divers, and support a huge ecotourism industry. Their focus on direct impacts on quality of life, community structure and integrity and respect for the preservation of coastal community culture argues to maintain or increase support for this program.

2015 Performance Review Panel Summary for

Maryland Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

This is a highly focused and relevant program which has had significant results in sustaining and restoring MD's iconic oyster and blue crab fisheries. MDSG understands that these fisheries are not only economically important but they are important to sustaining the integrity of coastal communities which rely on these fisheries. In addition, these communities are valued by themselves as iconic to the state of MD and all of its citizens. The approaches applied for research, education and outreach are collaborative and go well beyond the two identified land grant institutions of U of MD and the Eastern Shore to include the Smithsonian, the Naval Academy, Johns Hopkins and the full suite of colleges and universities in the state. Because of the focus on the Chesapeake Bay, collaborations have been well established and utilized with Virginia and Delaware with solutions transportable, for example for oyster aquaculture to the Gulf of Mexico and Louisiana in particular. All of these are hallmarks of a highly productive and respected program. Within the efforts targeting safety and sustainability of the oyster fishery is the development of methods to optimize both wild and aquaculture yield and the production of shellfish that are safe to consume. Working with MD academic partners and commercial oyster fishers, the success of their efforts are measured in the increase in product available for consumption annually and it appears this trend will continue. While developing best practices to produce a sustainable and safe fishery, it was noted that certain algae for forage provided nutrient removal improving water quality. This has gained considerable attention. Research results are typically published (one such publication was the best publication in a highly regarded journal in 2014). A total of 95 publications were completed in 60 journals during the 5 year period. In addition, research results were presented at a number of science conferences and public fora demonstrating the desire to disseminate results for application in MD, regionally, nationally and internationally. Research focused on blue crabs has filled gaps in life history information that has been incorporated into assessments which have formed the basis of new management approaches including restrictions on the harvest of females and reductions in overall effort. As a result, catches have been trending upward. This research has been conducted in collaboration with Virginia and Delaware, the other major players in the Chesapeake Bay blue crab fishery. Collaboratively these states provided new information to guide management throughout the Bay. The attention directed at MDSG research results from other states and regions is a testament to their productivity and the significance of their ability to provide practical solutions to improve the sustainability and safety of seafood in MD, nationally and internationally.

Reviewer: Nancy Thompson

Reviewer Type: 1

MDSG has pioneered the integration of ecological models and economic models in providing advice for ecosystem based management. This is an absolute necessity if EBM is going to be realized in practice. This is significant research that is moving this approach forward. This must continue and expand.

Finally, MDSG has developed teaching tools for the best and safe practices of oyster culture which has been increasingly adopted by the industry. In addition, working with the state agency MDSG has developed a tool to identify waters that can potentially cause viral disease in blue crabs reducing yield.

This is a complete program focusing on the most important fisheries and issues in the state, the region, the nation and internationally. Also, the program has provided a very readable and transparent document.

The impact the results of the research and outreach of the MDSG program have directly impacted the fishers, fisheries, and citizens of MD. The emphasis on improving the quantity and quality of oysters and blue crabs has improved the economic outlook for those who rely on these species to make a living. Sustainable fisheries, both wild and aquaculture, will continue to increase the availability of oysters and blue crabs to consumers in the state of MD. These two species are integral to the coastal identity of MD and MDSG has invested in insuring the integrity and viability of these coastal communities not only because of their intrinsic value but also because of their importance to tourism. Solutions to insure safety and sustainability of the oyster and blue crab fisheries have garnered considerable attention from other states including those of the Gulf of Mexico. These solutions are transportable globally. This program has figured out how to work with the states of Virginia and Delaware in a collaboration that has produced results directly applicable to assessments of blue crabs in support of this fishery throughout the entire Chesapeake Bay. It is clear that MDSG has been developed successful solutions, working in collaboration with other MD institutions, the fishing industries, state and national management agencies and the public. Funding likely is obtained from a variety of sources well beyond NOAA's Sea Grant program. Regardless, this program is successful in meeting its objectives and it is highly likely to continue to do so.

2015 Performance Review Panel Summary for

Maryland Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

The program has addressed most of the program performance measures with exception of work on live bait that is ongoing and work associated with ecosystem based management that is beyond control of program as regional, state and federal managers consider management plans. The program has focused on the fisheries of greatest economic importance, oysters and blue crabs with new technologies in oyster aquaculture with influences on statewide policy to open up 600,000 acres for leasing bottoms for oyster farming. This effort has resulted in 300 new leases covering 3,500 acres. Other efforts assisted loan applicants for 48 businesses and about 100 jobs in this new enterprise. Other work has provided oyster shells and spat and new settling tanks at nine locations produced spat on shell valued at \$7.8M. The program has been instrumental in launching commercial oyster farming in Chesapeake Bay. Other societal contributions include addressing the health of Chesapeake Bay with new watershed restoration efforts and funding graduate students in environmental science and federal policy and extending education to more than 70 undergraduate students. The program has been prolific with articles in the scientific literature and research that has resulted in management actions and policies. New flash freezing processes for crab meat increased processor revenues by about \$6M and new quality assurance program for crab meat increased revenues by \$17M. The economic impacts and benefits to industry sector has far exceeding the SG investment. The area of impact is mostly local but the Chesapeake Bay is America's largest estuary shared by multiple states. The program leveraged \$1,624,287 additional dollars to increase the scale and scope of program's contributions to science and technology. Researchers developed a model to predict likely spat fall locations of native Eastern oyster that influenced the Corps of Engineers to locate a major multi-year oyster restoration project as seminal test case for oyster restoration.

SG was instrumental in a buy back program for crab fishing licenses that takes pressure off fisheries and allows more predicted fishing activity after more than 700 licenses were retired with savings of \$750K. The program's partnering with more than 200 groups and organizations to restore Chesapeake Bay speaks to broader society engagement and benefits for restoring and sustaining the Bay and its fisheries. Overall economic program impacts to society is reported to be \$40M. Consumer health and safety are addressed in quality assurance program for crab meat and continued HACCP training. Important is that about 20 businesses are implementing new practices to increase revenues and preserve jobs. More than 1,000 have adopted responsible harvesting and processing techniques to improve quality and safety of

Reviewer: Gary Jensen

Reviewer Type: 2

seafood products. To address environmental concerns about more and larger aquaculture operations, efforts improved siting locations and management practices to minimize environmental impacts and supporting sector expansion. Public education is achieved through a magazine that reaches 40,000 print subscribers and online readers.

2015 Performance Review Panel Summary for

Michigan Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

This program is focused, mature and productive. The program identified three goals under SSSS which are 1) a sustainable seafood supply 2) a healthy and safe seafood supply and 3) informed consumers. The objectives established to meet these goals were all achieved and based on the proposed and actual performance measures in most cases exceeded the metrics. This program recognizes that Michigan is integrated into the entire Great Lakes watershed and over the past five years the focus has been on the waters of Lake Michigan with expansion into Lake Huron. The program recognizes that collaboration with other states will be needed to fully achieve success at the greater regional level and national level. The program includes a formal advisory committee that assists in setting program priorities and objectives. In addition, the program utilizes the strategy of developing an Integrated Assessment to identify problems, issues and potential solutions. More specifically to achieve the stated goals the program has developed and implemented programs that have had a significant positive impact both on the sustainability of seafood and the safety of seafood and has established ways to inform the public about both of these issues. Working with the commercial whitefish fishery, MSG help develop new fish products diversifying the available market and increasing demand for this species. By flash freezing filets, fresh fish has become increasingly available to the greater region. In addition, with MSG support, the industry is exploring fish oil as a consumer product which will fully utilize the catch. One question is how is MSG working with the state and Great Lakes fisheries regulatory agencies to insure that by promotion of these fishery products will not result in overfishing. This would be a new opportunity for MSG and as this fishery continues to develop, now is the right time to insure that the fishery doesn't become overfished or undergo overfishing. The effort to expand the states aquaculture effort is an appropriate avenue to further the availability of fresh fish. With MSG collaboration, aquaculture facilities are increasing and applying their best practices, are increasingly producing safe seafood. It appears there is a significant recreational fishery for this species and for Chinook salmon as well. MSG with angler collaboration established a Catch and Cook program where recreational anglers can have their catch cooked at local restaurants. In this way, anglers remain in the coastal region spending more dollars there rather than taking their catch home. There are valid concerns about the sustainability of the Chinook salmon fishery which has become one of put and take from hatcheries. With MSG assistance the state moved to stop the stocking of Chinook salmon and established a citizen science program to help in the collection of data on Chinook salmon including number caught, length and weight. These data are used in assessments to determine the impact of stocking on the population and recovery. Notably, MSG collaborates with government agencies (though not specified) at the local and

Reviewer: Nancy Thompson

Reviewer Type: 1

regional and national level; stakeholders; and tribes. Recognizing that water quality in the Detroit River which can impact a large urban population, MSG has been working with the city and state to disseminate information regarding alerts to water quality and use of the river. This is a large well funded program which is highly productive and its research, outreach and education are having a direct impact on all the citizens of Michigan and has achieved all of its goals. There is always more to do and this program is well positioned to continue and expand its current research and outreach while pursuing new research and outreach activities that are guided by current and foreseeable issues. This program has taken full advantage of the diverse expertise available through the two major universities.

The MSG program has had and will continue to have direct impact on the quality of life of its constituents and the overall economy of the state. MSG worked with the commercial fishing industry to expand its product line and increasing the availability of fresh, safe seafood. In addition, MSG works with the aquaculture industry to increase the availability of fish and works with the industry to insure the safety of its products by working directly with the industry or providing educational materials on how to produce safe seafood. MSG works directly with the Michigan Aquaculture Association to insure biosecurity of its products. As a result of MSG's research and outreach, 4 times the number of new fish products were developed and marketed; 4 times as many participants attended workshops focusing on seafood safety and sustainability (the public); and almost 5 times as many aquaculture facilities developed and implemented biosecurity plans for their products. While these efforts have been appropriately focused on Michigan residents, these programs and strategies can be transported to other states, regions or fisheries. Without the efforts of MSG, it appears unlikely that this progress in the establishment of safe and sustainable seafood would be achieved. The program is ambitious yet focused and as a result the program has been highly productive and exceeded the performance measures of each objective.

2015 Performance Review Panel Summary for

Michigan Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

The program has a strong capacity in developing AIS HACCP materials and biosecurity protocols linked to training initiatives on a regional scale. MI has taken a leadership role in this area. SG funded new strategic plan for aquaculture has reinvigorated interest in supporting aquaculture including MOU agreements that has resulted in new facilities and new legislation for tax relief. A new initiative partnered charter boats with restaurants including seafood safety and handling education to meet state requirements. This new collaboration serves as a model for other states and counties. The Catch and Cook program received recognition from the Governor on Innovation Tourism Collaboration. A feasibility study on fish oil from local fisheries may result in new value added product.

Efforts in developing a fishermen cooperative has resulted in product branding, new markets, and new product lines for higher prices. Independence is demonstrated by cooperative managing their own web site. New compost material from fish waste and partnership with seafood processing company offers new business opportunities and higher profits. The program has excelled in reaching remote areas with HACCP training and focused on tribal needs to help sustain their commercial fishing traditions. The Salmon Ambassadors program is created citizen scientists and helping improve management decisions in stocking Chinook salmon. The program reaches the public with web materials and new cookbook received award from the National Association of Government Communicators. Other work related to fish consumption advisories reaches consumers and boaters in addition to educational materials for K-12 classroom lessons. A guidance document on permit application process for net pens in state could create a new industry sector in the future.

2015 Performance Review Panel Summary for

Minnesota Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

NSG Funding for the Minnesota program is about \$399K for SSSS, making this the 3rd smallest program.

Key science and technology areas are control of aquatic invasive species, genetically modified organisms and their effect on wild populations, the Lake Superior ecosystem, and baitfish aquaculture.

A joint project with Wisconsin Sea Grant on freshwater corrosion received the 2014 Research to Application Award from the Sea Grant Association.

MNSG sponsored an International Symposium on Genetic Biocontrol of Invasive Fish in 2010, that resulted in publications, including a special issue of the journal "Biological Invasions" in 2014. MNSG has developed technical innovations for control of invasive species that have national impact.

MNSG research improved the stock assessment for Lake Superior cisco, leading to outreach and economic development impacts discussed later in the report.

A significant ecosystem finding was that high flood runoff into Lake Superior in 2012, rather than causing an algal bloom due to high nutrient load, instead decreased primary productivity due to the impact of dissolved organic matter blocking sunlight.

The program accomplishments and impacts are primarily State and Regional in scope, with some national and international impacts.

MNSG has made significant societal contributions beyond science and technology.

One example is its work with Lake Superior commercial fisheries. Following up on the improved stock assessment for cisco that indicated a sustainable level of harvest, MNSG developed an outreach event that attracted good media coverage and helped develop a consumer market for Lake Superior fish, including cisco. The event has evolved over several years, partnering with WISG in 2013, and then taken up by a sponsor, Lake Superior Magazine.

Another example is in outreach on aquatic invasive species. MNSG works with baitfish aquaculture operators, providing information not only on how to culture baitfish, but also how to control the spread of aquatic invasive species. This work has national impact as well, as MNSG materials are being used to

Reviewer: Galen Tromble

Reviewer Type: 1

train employees in over 180 hatcheries in 30 states in techniques to prevent movement of potentially invasive species.

MNSG promotes education through its support for the Great Lakes Observing System and the Center for Ocean Science Education Excellence Great Lakes.

MNSG met or exceeded 3 of 4 performance measures, and achieved 93% of its target for the 4th. MNSG achieved 6 of 10 program objectives. 3 of the missed objectives were due to a single project - a web-based Lake Superior fishing resource that was not developed due to staffing retrenchment. The 4th was related to baitfish aquaculture, a program that was moved to University of Maryland Extension in 2011.

2015 Performance Review Panel Summary for

Minnesota Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

MNSG has invested \$398,806 in the SSSS focus area during the review period. Overall, the program has three goals. Most program objectives were met or exceeded and for those that were not, adequate explanations were provided as to why not, e. g., aquaculture efforts were moved to University of Minnesota Extension in 2011 and the fisheries programming effort was reduced for budgetary reasons and because the Director's position was vacated. Overall, SSSS effort has been reduced and reassigned to the open director position, thus cutting the program's fisheries outreach.

MNSG has produced 12 journal articles generating 165 citations since publication.

MNSG research led to the development of Sleeping Beauty, a transposon system which now has shown application for human health. The technology is now used to transport normal genes into genetically damaged cells that cause problems like retinal degeneration and cancer. Recently, two biotech companies paid \$100 million to license a cancer drug made with Sleeping Beauty.

MNSG hosted the International Symposium on Genetic Biocontrol of Invasive Fish in 2010 which led to 3 journal articles and a special issue of Biological Invasions. The symposium also led to several national and international policy recommendations.

Minnesota Sea Grant examined the long-term consequences of letting genetically modified fish mingle with wild-type populations of the same species and found only a single fish in one of six replications still carried a growth-enhancing gene construct after nine generations.

PCR primer sequences for slimy sculpin enabled the Minnesota Department of Natural Resources to choose source populations and numbers of stocked fish needed to meet minimum genetic diversity goals in reintroduced populations.

Experts expected that the major influx of nutrients into Lake Superior after a major flood would boost algae growth. Instead, findings suggest that primary production declined after the flood because vast amounts of dissolved organic matter in water prevented light from penetrating much beyond the surface.

Reviewer: Jim Murray

Reviewer Type: 2

The promotional program for the cisco fishery led to several restaurants in the Twin Cities placing cisco on their menus for the first time ever, the price of cisco increased by 75%.

As a result of AISHACCP training for Ontario Ministry of Natural Resources personnel by MN and MI Sea Grant, every bait dealer in Ontario must now have an AISHACCP Plan.

Based on support from MNSG NEMO, the cities of St. Cloud, Sauk Rapids and Sartell are conducting a first ever "Urban Area Planning Process" to assist in identifying opportunities to make the Mississippi River more a part of their communities. Eleven communities adopted the Mississippi River Renaissance vision.

2015 Performance Review Panel Summary for

Mississippi-Alabama Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Strong linkage of program accomplishments and performance measures to strategic plan objectives. Although primary program focus appeared to be on extension, training, and education for seafood industry participants, there were notable region wide research contributions:

- Development of a rapid cost effective test for vibrio vulnificus in oysters and testing of high salinity depuration to reduce VV levels and research on oyster growth in sewage affected areas
- Development of smart phone app for education and real time reporting on marine mammal strandings
- A study providing an improved understanding of hook and line gear and catch to improve regulations designed to reduce reef fish bycatch and discards
- Implementation of a next generation method to provide information needed develop sustainable genetic mapping plans for candidate species for stock enhancement
- Improvements in recirculating baitfish culture handling of solid waste to improve water quality and provide nutrients for marsh plants.

In addition to its research projects program had an extensive array of training and education accomplishments that provided direct benefits to Gulf resources, the seafood industry and consumers throughout the Gulf region.

- It put together a variety of educational and training activities to address the impacts of the Deepwater Horizon oil spill, a need not envisioned in its Strategic Plan,
- Reduced shrimper operating costs and improved use of Bycatch Reduction and Turtle Excluder Devices through gear testing and demonstrations
- Through Shrimp Trade Adjustment and oyster farms extension activities created a reported over \$ 5 million in economic benefits to both industry sectors. Initial target was \$440,000

Reviewer: Bruce Morehead

Reviewer Type: 1

- Doubled the target number of reported producers, distributors and consumers of seafood who modified their practices using knowledge gained in fishery sustainability, seafood safety and the health benefits of seafood.
- Exceeded target of number of commercial and recreational fishermen, aquaculturists, resource managers and seafood businesses who adopted and implemented responsible harvesting and processing techniques and practices.

2015 Performance Review Panel Summary for

Mississippi-Alabama Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

MASGC invested \$2,725,459 in the SSSS focus area during the reporting period. The program reported a total of 16 impacts and 27 accomplishments. The report was very well written with the PIER report nicely distinguishing between impacts and accomplishments. All program objectives were met and some were greatly exceeded.

A simple, rapid and low cost Vv kit to currently accepted methods that will expand industry capacity to develop new PHP approaches such as high salinity relaying or depuration.

A new oyster processing technique using high salinity water to depurate oysters shows promising results in reducing risk associated with consuming raw oysters and is being further examined to reduce variation in the process.

A growth trial was conducted at different salinities and temperatures to explore the effects on growth and survival of juvenile shrimp. Another study was conducted to evaluate how various aqueous sodiumpotassium ratios at different temperatures impacted survival, growth and osmoregulatory capacity of shrimp. Increased survival through better acclimation of cultured shrimp has allowed farmers to increase their production at harvest by more than 500 pounds per acre compared to when the study began in 2008. The annual economic impact is approximately \$1,200,000 to date (\$200,000 per year).

A two stage treatment system was designed and installed that incorporates geotextile bags to dewater the solid wastes and uses a series of mechanical and biological processes to remove excess nutrients such as phosphorus and nitrates so that the water can be recycled and effluent minimized.

The program has shown numerous economic benefits to the shrimp fishery and aquaculture industry, e.g.,

- 1) Total savings to the fleet through energy saving programs has topped \$1 million since the program's inception.
- 2) The results of the oyster gardening restoration focused program and the commercial off bottom oyster farming program resulted in nearly a \$300,000 value for ecosystem services.

Reviewer: Jim Murray

Reviewer Type: 2

3) Sea Grant funded scientists established two large oyster farming parks that serve as platforms for training and business development.

4) Nine new commercial oyster farms have been established in Alabama, with a total farmgate value exceeding \$825,000 to date.

5) Two new oyster equipment companies were established in Alabama, with total sales inception well over \$100,000.

6) In Alabama and Mississippi, 789 shrimpers each received 12 hours of Intensive Technical Assistance under the Trade Adjustment Assistance Program for Shrimpers, making each eligible for \$4,000 in cash benefits. So far, this totals \$3,156,000.

118 people participated in the Mississippi Master Naturalist Program. Of those participants, 35 people earned certification as Mississippi Master Naturalists. They donated a total of 4,265 hours valued at \$65,809

The response to the DWH spill was truly laudable. MS/ALSG was all over it. MS/ALSG has been a leader in developing partnerships with NOAA and regional agencies in the Gulf of Mexico. The regional programs that MS/ALSG has been involved in with other Sea Grant programs represents more than \$10 million in research and outreach funds for the region.

73 fishermen in Mississippi and Alabama have become Coast Guard Certified Commercial Fishing Vessel Safety Drill conductors.

In partnership with NOAA Fisheries, MASGC funded the development of two smartphone apps that are being used to identify and promote responsible viewing of dolphins and facilitate the reporting of stranded animals to the network.

An excellent use of the television media was provided by MASGC which created 33 short videos about coastal issues, which potentially reached hundreds of thousands of residents while they were aired during a popular outdoors show on a PBS TV station.

2015 Performance Review Panel Summary for

MIT Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Significant contributions in assisting fishermen directly marketing product to consumers, an evaluation protocol for catch share programs, conducting a social impact analysis of the Herring FMP, providing information of extent of invasive species impacting the Scallop Fishery, and sound analysis projects to study fish behavior and impacts on tautog. Other contributions were focused on developing and deploying assessment technologies for New England species. Program had impacts primarily in New England with the exception of the Catch share protocols which is being used on West Coast. It was difficult to fully evaluate the program as qualitative information was provided on achievement of program objectives and performance measures were narrowly focused on a few objectives

Program is making significant contributions to the management of New England fisheries through resource information, assessment tools, and social science assessments. Direct assistance to improve fishing industry economics was provided through development of the Cape Ann Fresh Catch program and its expansion as a business model to other regions. The social impact analysis of the Herring Fishery FMP will provide the New England Fishery Management Council better understand plan impacts on New England fishing communities. Program provided safety training for fishermen and deployed an assay to detect PSP toxins in situ which address shellfish resource and human health goals

2015 Performance Review Panel Summary for

New Hampshire Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

The NHSG program contributions to advancements in science and technology come from the support of cutting-edge research and expert extension outreach in order to have them utilized to reach SSSS focus area goals. In order to address fisheries management and estuarine and coastal ecosystem degradation issues as they relate to SSSS, NHSG-funded researchers focused on improving the effectiveness of science and management in conserving coastal ecosystems and stocks, while helping fishers and communities adapt to stresses imposed by marketplace, ecological and management trends. Researchers authored 20 peer-reviewed journal articles in the SSSS focus area from 2010 - 2013. The outcomes of these efforts were integrated with extension efforts in four thematic areas: 1) modifying gear and innovating on the water (e.g., gear selectivity and vessel technology improvements); 2) developing aquaculture methods and transferring technology to foster the development of production and business activity, includes species selection, site evaluation, permitting, and developing and implementing experimental and demonstration programs for growout technologies and marketing. (e.g., investigating the feasibility of multi-trophic (multi-species) aquaculture that integrates fish, shellfish, and kelp culture which improves production while minimizing environmental impacts to the host system); 3) improving local seafood marketing and fishing business best practices to support alternative markets for seafood in a variety of innovative and engaging ways that take into consideration the producers of local seafood products, purveyors of those products, and consumers (e.g., survey-based research on the potential for local seafood marketing to add value to local fisherman and fishing-related businesses); and 4) supporting fisheries science to inform fisheries resource management, by making significant investment in research to improve stock assessments for lobster, groundfish, alewife, and shad (e.g., gear design, improved methods to estimate lobster fecundity, innovative and non-destructive hydroacoustic methods to estimate groundfish abundance in non-trawlable habitats).

The areas of impact are local, state, regional, and National. NHSG's role includes research funding, collaboration, extension/advising/outreach/education. The science and technology contributions seem to be commensurate with the size of the program.

The societal benefits of the program are largely integrated with the outcomes of the contributions to science and technology. These would be interim steps supporting a healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly to meet public demand, and a

Reviewer: Steven D. Giordano

Reviewer Type: 1

resilient fishing community with the capacity to adapt to a dynamic regulatory environment and changing marine ecosystems. Specifically, the societal and economic benefits include, but are not necessarily limited to the following:

- Improved coastal habitats in NH
- Estimated \$1 million in ecosystem services contributed by shellfish aquaculture in Great Bay
- Improved seafood business models
- Improved seafood safety and safe handling guidelines for fishers and seafood processors
- New multi-species aquaculture industry
- Educated seafood consumers
- Educated seafood harvesters, producers, processors, and sales force
- Pathogenic *Vibrio* research and control plans to protect human health and aquaculture business viability
- Improved science-based fisheries resource management, including more sustainable fishing technologies

The economic benefits are realized mostly in the developing potential of new and expanded sustainable aquaculture businesses, improved management of fisheries, the development and marketing of fresh local NH seafood brands, development, testing and use of viable operational efficiency measures for commercial fishing vessels.

Regulatory and economic efficiencies were realized as a result NHSG programming.

The areas of impact for these programs has been primarily state and local, with potential regional and national transfer and application of findings to management of seafood businesses and natural resource management.

NHSG's primary role has been to support and participate in research, technical assistance, outreach, education, and management support.

2015 Performance Review Panel Summary for

New Hampshire Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

The program has made some significant contributions. Several are referenced that are excellent examples. Some other research activities are completed or ongoing with little data on outcomes. Program has good record of contributing to the peer reviewed scientific literature with 20 articles. Program has increased shellfish aquaculture production and ecosystem services value from farmed shellfish reducing nutrient loading in one bay was estimated at more than \$1M. Data suggests more reductions with expanded shellfish production. Vibrio research resulted in new control plans to protect human health and preserve businesses. Program research on arsenic levels in harvested seaweed for human consumption is safe with better understanding of human exposure. Pathogenic Vibrio research used to develop monitoring programs in neighboring states and use detection methods to protect human health and preserve shellfish sector. New protocols for alewife broomstick spawning and hatchery research demonstrated commercial scale output of young and adoption of protocols by private company. NH and CT teamed to develop technology to establish seaweed nurseries that can support multi-trophic aquaculture as well as kelp growers. Program identified acoustic signature of cod to improve population estimates that resulted in spawning season closure in a managed area.

Program helped develop a community supported fisheries for fish and shrimp through a new cooperative of fishermen in addition to developing a new local seafood brand for premium pricing. Program's outreach informed the public on commercial fisheries and more than 1,450 people participated in CSF. This new direct marketing scheme resulted in higher profits to fishermen and weekly deliveries to 250 consumers. Over time one would expect more participants and higher sales volume. Program assisted a Fishermen's Coop and other businesses to overhaul business management software with significant cost savings and more staff time for market development. With Program support a book was written about historical fishing in the Atlantic that received prestigious awards. This is a contribution to the public about historical fishery populations. Program joined others with specific task to remove lobster gear from coastal areas that included 189 tons of gear and helped restore 700 acres each year for public use. Research and outreach has resulted in acceptance of dogfish in some restaurants to overcome barrier as food item and gateway for more under utilized species. Other research has resulted in higher prices to fishermen and new marketing channels for underutilized species. Program is pioneering multi-species aquaculture to address water quality concerns and integrate trout, mussels and kelp. This provides fishermen a business alternative. Program is helping get

Reviewer: Gary Jensen

Reviewer Type: 2

through permitting process for shellfish aquaculture on state owned bottom leases. There are now 26 new jobs. Program helps form Fisheries Extension Network Council to leverage expertise across states to better contribute value to society from SG. NH partnered with ME for National Community Supported Fisheries Summit to expand alternative marketing strategies and local successes to nation. The program's reach and contributions to society are many that reflect the breadth of the program and integration of the functional programs.

2015 Performance Review Panel Summary for

New Jersey Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

This program has demonstrated significant support for fisheries science and technologies. The program cited several studies in data-limited and important commercial and recreational fisheries which have been applied and extended at both the state and regional levels. Specifically, the hiring of a dedicated Shellfish Aquaculture Program Coordinator and support of this staff person beyond the initial term of funding has shown significant impacts. Extending this position has enabled NJSG to grow the program and extend its outreach, and use of leveraging funds to do so demonstrates successful partnership and commitment to this issue. Continuing to fund this aspect of the Program was a smart decision to continue to expand aquaculture and oyster work, and to develop relationships within the growing community and change behavior in this industry. The impacts here are primarily on the state/regional level with the research affecting fisheries in NJ and stocks along the mid-Atlantic. Support for benthic imaging technologies has potential national and global impacts, as does the CMSP legal workshop. NJSG's most direct impacts are through the production and dissemination of science to partners. Extending these research impacts further is a recommended next step. Relative to the size of the program, NJSG has made some significant contributions in fisheries research by targeting a few specific fisheries and research areas.

NJSG's investments outside of science and technology have focused mostly on working directly with stakeholders inside the commercial, recreational, and aquaculture sectors. While some community-based work has been done through the PORTS program on oyster restoration, increasing these type of community programs and programs targeted toward seafood consumers and the general public would increase the scope of influence of NJSG's impacts. With a modest budget, NJSG has been smart to focus its efforts in this way, particularly with its emphasis on oysters, which have an additional water quality ecological benefit in addition to significance as a fishery. However, a successful partnership with NJDA would have enabled greater outreach and education materials. The Program overall seemed to have difficulty in setting appropriate/achievable POs/PMs in this area which could be achieved by NJSG alone. Several of the accomplishments cited outside the science and technology areas fail to demonstrate direct connection to safe and sustainable seafood supply and seem tenuously connected to NJSG. It is not clear how direct of a role NJSG had in Clean Vessel Act initiative, and while it is doubtful that the Program contributed to water quality improvements in this regard, it is questionable the extent of

Reviewer: Megan Mueller

Reviewer Type: 1

impacts which can be directly attributed to NJSG. The impacts in this area are primarily local and state based, particularly with regard to the PORTS program and impacts on disadvantaged communities.

2015 Performance Review Panel Summary for

New Jersey Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 4

NJSG has invested \$1,056,611 in the SSSS focus area over the review period. Their work focuses on two program goals and eight impacts and 33 accomplishments were reported in PIER although many were redundant. Some of the impacts should have been listed as accomplishments (18 shellfish forums were held). Many of the program objectives were not achieved and there was not a good rationale provided as to why not.

Some of the impacts included winter flounder research that has assessed the changing distribution of winter flounder has resulted in evidence of a northward shift of population in the MidAtlantic Bight that is being considered by managers seeking to ease dredge restrictions in the Cape May area and which led to a closure on the winter flounder that was partially lifted for offshore commercial fishing this year. The data from another study indicates the importance of developing a sex structured model for summer flounder.

A researcher was the first to successfully developed a 16multiplex microsatellite assay in a single reaction in an aquaculture species. This is a breakthrough in microsatellite genotyping in oysters and provides key technologies for family based selection.

The pattern of *Anguillicola crassus* infection from American eels collected in New Jersey was determined by a researcher.

Three NJ oyster growers formed a cooperative that has enabled them to increase farm profitability by 30% via shared infrastructure for direct market sales.

NJSG has integrated scientific assessments of oyster stock performance at two local oyster farms and as a result growers identified best performing oyster strains which will increase production.

NJSG's partnership with NMFS on two graduate fellowships is helping NMFS to secure a future workforce informed with the latest stock assessment training.

2015 Performance Review Panel Summary for

New Jersey Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

New Jersey Sea Grant received \$1,057K for SSSS from the national program.

In its strategic plan NJSG said that two other focus areas were their priorities, and they intended to meet needs in the SSSS focus area by working with partners and leveraging resources.

One example of that is NJSG partnering with Rutgers University and the Haskins Shellfish Laboratory in 2011 to hire a shellfish aquaculture program coordinator. Initial funding was for two years, but the partnership has been able to continue the position, leading to significant positive impacts, helping the oyster industry in Delaware Bay. Along with other researchers, work included development of intertidal rack and bag oyster culture, and development of fast growing, disease resistant oysters.

Research findings on the sex ratio of summer Flounder (SSSS #19223) have resulted in NMFS incorporating the information into their fisheries models that affect spawning stock biomass which ultimately affects the total allowable catch that is used for developing quotas.

NJSG is now supporting other Summer Flounder proposals that are studying early life history dynamics of summer flounder that affect recruitment to adult stocks at the local and regional level.

Multiple research projects on winter flounder funded by NJSG have led to new regulations that allow winter time dredging of marinas without concern for destruction of winter flounder spawning habitats (SSSS #21775).

Other research has been conducted in recreational fishing for striped bass, marine debris, and artificial reefs.

Regional and national level activities included hosting a legal symposium on coastal marine spatial planning in the mid-Atlantic, a benthic imaging workshop to aid stock assessments and habitat assessments, and research on invasive species through the bait trade.

Reviewer: Galen Tromble

Reviewer Type: 2

NJSG assists shellfish aquaculture operators with extension services, helping to increase the oyster industry in Delaware Bay, and support the continued development and production of

intertidal rack and bag oyster culture. In addition, NJSB developed a monthly forum for watermen and an oyster co-op (SSSS #21204 and #21197). As a result, Delaware Bay's oyster

farmers now have access to continued information on grow out, production and marketing support including trade fairs and organized site visits by regional restaurants. By banding together, growers have been able to reduce purchasing costs. As there is ongoing support for the agent, NJSG sees a continued and growing success in remaking oyster culture a vibrant industry in New Jersey.

Efforts in fisheries and aquaculture are also integrated with education. Project PORTS (Promoting Oyster Restoration through Schools) (SSSS #18040 and OECEL #18976) raises awareness of the importance of oyster reef habitat to Delaware Bay. This community-based oyster restoration education program builds oyster reefs and stewardship.

in Cumberland County, New Jersey, presently the poorest county in New Jersey, the Project PORTS program is conducted annually to expand educational opportunities while improving oyster habitat and developing sustainable stewardship. In 2013, Project PORTS engaged 969 students from 8 southern New Jersey K-8 schools. Participating students constructed 2400 shell bags, which served as substrate for oyster recruitment. Student assessments demonstrated a 106-120% increase in student awareness and knowledge. The shell bags naturally recruited oyster spat and contributed to the ongoing enhancement of oyster reef habitat at a 5-acre conservation site. The project also engaged 98 volunteers who contributed 302 service hours.

The importance of oyster reefs for habitat function and biodiversity has also been developed into an educational game that NJSG Education program staff use at multiple public outreach events.

NJSG met 2 of 5 performance measures, and 2 of 7 program objectives.

2015 Performance Review Panel Summary for

New York Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Ongoing research and advancements in technology supported by NYSG are target in a few ongoing research areas, and in supporting data-poor recreational fisheries. NYSG cites a great deal of ongoing research on hard clam parasite QPX, with monitoring efforts ongoing since 2002. During the 2010-2013 period NYSG supported multiple research studies which improved practices to minimize the impacts of QPX. NYSG has held workshops supporting the design and operation of benthic trawls for survey in Great Lakes fisheries which have been attended by professionals from the state, region, and beyond including Iowa and Canada. The workshops seem successful, as NYSG reports participants have submitted survey designs for review. Research has also enabled the differentiation of distinct population segments of Atlantic Surgeon and supporting 4/5 segments as endangered under the ESA; this research could make the difference between the species surviving and becoming extinct. NYSG also funded research on red tides used by NYSDEC for shellfish monitoring and area closure decision support. The mix of new and ongoing research projects illustrates the nimbleness of the program, but the number of partnerships and projects that fail to connect the research to application indicate that additional monies in the \$4 million budget could likely further develop these connections.

NYSG has done a good jobs with some training courses that have direct and traceable impacts. However, too many of the performance measures rely on passive dissemination of information only. The program's safety-at-sea workshops have gained regional and national recognition. With the importance of human life and this program serving to support both commercial fishing businesses and fulfilling USCG requirements, it seems this program is ripe for expansion beyond the approximately 100 participants. NYSG runs online training for the Seafood Hazard Analysis Critical Control Point to support seafood safety as well as comply with other federal and state regulations related to safe seafood handling. This supports the goal of industry education and promoting a safe seafood supply. Online trainings are cost-efficient to provide, and allows NYSG to expand its reach without repeatedly expending new resources to redeliver educational materials to new audiences. Internet resources also allow for national influence, as the training course is used across the country. The influence of NYSG here is more evident than in some other programs cited, such as the Seafood Health Facts website in which NYSG was a partner, and has no clear leadership role. Many of the outreach and education components cited by NYSG lack a clear means of measuring impact: attendance at trade shows and handing out brochures does not guarantee education. For example, a 25% decrease in angling violation

Reviewer: Megan Mueller

Reviewer Type: 1

correlated with the release of 5,000 ID guides for trout and salmon species does not equate causation; more information on levels of enforcement would be required to draw that conclusion.

2015 Performance Review Panel Summary for

New York Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3.5

NYSG established ambitious objectives under their 2 SSSS goals. A goal of sustainable fisheries included the following objectives: identifying and addressing causes and remedies for fish decline; inform recreational fishing communities about new tools applied successfully elsewhere to manage coastal fish stocks; and educate children about the recreational value of fishing. Under the goal of safe seafood products, the following objectives were included: assist businesses, decision makers and other interested parties to use information on current issues, policies, regulations, or other conditions that could affect the productivity and profitability; educate seafood business owners and operators to obtain the knowledge and skills that they need to build and manage an effective Hazard Analysis Critical Control Point (HACCP) based food safety plan and comply with the requirements of the Food and Drug Administration's (FDA) and aid the training of state or federal food safety inspectors in HACCP principles and the FDA Seafood HACCP regulations; support research to facilitate the potential expansion of sustainable aquaculture in New York State to increase seafood products for New York and U.S. consumers.

Under the first goal, they list a number of accomplishments that include

As far as accomplishments are concerned, they established a new lab to diagnose diseases in shellfish. This was apparently accomplished long before the latest strategic plan timeline. But its available if need be. They worked with fishermen to design more efficient trawls used in assessment surveys. It is not noted if this gear was adopted by fishermen to improve catch per unit of effort in the fishery itself. They worked with other agencies to identify Distinct Population Segments for sturgeon listed under the ESA. While the first accomplishment does impact sustainability of clams, for example, its not apparent how the other accomplishments support the goal. In the PIER one of the most significant accomplishments is the reduction of bias and uncertainty in acoustic surveys used in population assessments; though it is focused on recreational stocks in the Great Lakes. Why commercial species aren't included is not known. NYSG designed a more efficient trawl for surveys and transferred this technology to the commercial trawl fisheries which is a significant accomplishment.

Under seafood safety they have conducted workshops and training in establishing HACCP plans for processors and for aquaculture businesses. This appears to be a highly successful endeavor and should be continued. They have also supported vessel safety workshops which has been attended by 100 commercial fishermen. NYSG worked with partners across the country to develop a website for

Reviewer: Nancy Thompson

Reviewer Type: 2

consumers. The Seafood Health Facts Website at <http://seafoodhealthfacts.org> provides consumers and health care providers with information on the risks and benefits of the seafood products (SSS16958). The award-winning site has been accessed by over 60,000 individuals helping them to make informed decisions about their seafood consumption

NYSO acknowledges that the limitation in funds has impacted their ability to accomplish more towards meeting these goals. In fact, it is noted that they need to become more creative about seeking additional sources of funding.

In reviewing these accomplishments, it is clear that some were initiated before the latest strategic plan was completed.

Their efforts to increase HACCP awareness and training has a direct impact on public health by insuring the consumption of safe seafood. In addition, their recognition that fishing is risky and convening safety workshops for fishermen also has a direct impact on this profession. The establishment of a shellfish disease lab which probably could be extended to fish, translates to their being prepared to diagnose diseases when they are observed and provides the ability to curtail fishing if need be to protect both fishermen and consumers. There could be technology transfer with the new trawl design if in fact it is that much more efficient that commercial fishermen are using it. This could be expanded through collaborations with other Great Lake states. The program seems content to be providing support and conducting research and outreach at the very local level. There are probably opportunities to work with the other Great Lake states and mid Atlantic states to develop new gear to improve catch quality and reduce by catch for example. While CT recognizes work with NY, there is no highlighting of work with CT in Long Island Sound.

2015 Performance Review Panel Summary for

North Carolina Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Overall, 29 impacts and 6 accomplishments were listed. The program objectives were well stated (e. g., action/behavior change type objectives) and robust. NCSG met or exceeded all of its performance measures. A number of the impacts described in PIER were not truly impacts, but rather descriptions of study results and thus should be considered accomplishments (Organizing Catch Summits, a study leading to NSF supports, etc.). For the Program Objective “Number of producers, distributors and consumers of seafood who reconsider and/or modify their practices/behavior using knowledge gained from NCSG on fishery sustainability, seafood safety and the health benefits of seafood” numbers were provided, but the numbers appeared to be of those who attended NCSG events and there was no evidence that they reconsidered or modified practices or behaviors. Overall, the impact descriptions could have been enhanced in the PIER descriptions. For example, in the area of seafood technology there were several new products developed that had an economic value and led to jobs, etc., but it was only the crab cake project where the impact numbers were described.

The Program objective to have fishery agencies use NCSG results was strongly met as was the “90 seafood processors/wholesalers/retailers will have adopted or improved safety or processing practices” objective.

SSS is well leveraged and the program has developed numerous and significant partnerships with fisheries management agencies. FRG, blue crab and marine mammal bycatch (NMFS) programs research programs provide NCSG a unique advantage to fund applied research projects.

There is evidence that NCSG research is being published in respected peer reviewed journals, but journal publications statistics would have been useful.

Several projects resulted in improved fisheries management including results from a black sea bass gear study which led to a revised stock assessment by the SAFMC and increased TAC from 847,000 lbs. annually to 1.8M. Another stock assessment project of striped bass in the Albemarle Sound-Roanoke River resulted in for the first time striped bass fishing mortality from outside the system being included in stock assessment numbers. NCSG demonstrated successful use and the potential of text messaging to compile online recreational fisheries data, resulting in further testing by DMF and interest from federal fishery managers. The resulting discussions sparked a fisheries data collection program in Maryland. Overall, the program claims that at least 15 state and regional fisheries management plans have been influenced by NCSG research.

Reviewer: Jim Murray

Reviewer Type: 1

In the area of aquaculture, a new shellfish siting tool was developed and 1,200 visitors looked at it on line, but it is not clear the program can make the claim that new aquaculture businesses resulted from it. Advances in hybrid striped bass broodstock genetics are being applied by the national industry.

The U.S. Army Corps of Engineers uses NCSG research quantifying the role of beaches and surf zones to review beach nourishment projects. In another project, state fisheries managers now consider culverts' roles in hampering migration of alewives.

NCSG researchers quantified the role of beaches and surf zones as highly productive habitats for primary producers, including zooplankton, and a primary nursery area for migratory fishes. The USACE uses these results to review beach nourishment projects.

Through a training course administered and delivered by NCSG, 173 shrimp businesses in North Carolina have collectively participated in 2,076 credit hours of TAA courses (12 hours per business) and received \$1.98 million in financial assistance to implement new business plans.

Two NC seafood processors launched nine new value-added products in wholesale and retail trades through assistance by NCSG. The crab cake project the total economic value of the product would be about \$225,000 annually. The Seafood School, a program that educates health inspectors about the impact of harvesting and processing on seafood quality and safety; HACCP safety plans; and retail measures to ensure the safety and quality of seafood certified 29 inspectors in seafood inspection in 2012 by the North Carolina State of Practice Committee. Over 600 specialists have received their certification since 1993.

2015 Performance Review Panel Summary for

Ohio Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

OHIO SEA GRANT COLLEGE PROGRAM EVALUATION FORM: VANCE P. VICENTE

For over 35 years Ohio Sea Grant has worked to restore Lake Erie and rejuvenate the local and state economy. At its Stone Lab field station, OHSG offers about 25 college courses to annually to high school students, teachers, and college students from over 110 colleges. OH Sea Grant led the creation of the Great Lakes Research and Outreach Consortium (GLROC) which allows Sea Grant Networks programs to accept subcontracts from other programs without charging indirect costs. OHSG also led development of Lake Erie Literacy Principles (consistent with NOAA Ocean Literacy Principles) which resulted in teacher education courses at 10 Universities. Sport fishing contributes to \$1 billion /yr to local Lake Erie economy. The Ohio State \$600,000 steelhead stocking program produces \$35 million /yr.

The Ohio Sea Grant College Program has three (3) Program Goals for the 2010-2013 period. Program Goal 1 (Sustainable fisheries to meet public demand) has six (6) impacts listed and seven (7) accomplishments listed in the evaluation. Significant impacts on sustainable fisheries to meet public demand includes the OHSG organized Ohio Charter Captain Conference which includes education in marketing, business tips, marine laws and regulations among others. The OHSG also helped local communities remediate damage to the Ashtabula River and increase fish population in the lower 2.5 miles of the River. The OH SG also is working effectively with the River Remedial Action Plan Council: removal of 700,000 cubic yards of contaminated sediments and to remove restrictions on this area. OHSG also working on the Ohio's Aquatic Invasive Species Management Plan, and on the otolith microchemistry as a natural tag for mixed stocks of steel heads. Other important impacts will be discussed in the presentation. The accomplishments under this goal are also very significant and directly related to the program. For example, the development of the new rapid and accurate method to detect VHS infection in fish is outstanding. Other significant accomplishments will be presented in the discussion.

Program Goal 2 (A healthy Lake Erie fisheries that harvests, produce process, and/or market fish products responsibly and efficiently) has seven (7) impacts listed and five (5) accomplishments explained. As previously pointed out, OHSG organized the Ohio Charter Captain Conference in benefit to all on marine regulations and laws among others. In addition, also mentioned before, the benefits of OHSG on the restoration of habitat and fish populations of the lower Ashtabula River section has been very successful. Impact of the otolith microchemistry as a natural tag has been a significant scientific

Reviewer: Vance Vicente

Reviewer Type: 1

contribution in understanding mixed stock and applications (e.g. stocking further upstream). OHSG also has had an impact on Aquatic Invasive Species like the Asian Carp and others through outreach programs. Accomplishments listed are also successful towards the goal of the program. For example, bringing together scientists from 109 Universities and businesses, for the Great Lake Restoration Initiative. In 2005 Stone Lab initiated research experience for undergrads to conduct research under guidance of Universities or agencies. Other accomplishments (e.g. temporal and spatial analyses of Walleye and Yellow genetic stock structure) which will be discussed in the presentation have been extraordinarily successful under the OHSG program.

Program Goal 3 (Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our Lake Erie fisheries, who appreciate the health benefits of fish consumption, and who understand how to evaluate the safety of the fish they catch) has six impacts and nine (9) Accomplishments listed. The educational and outreach programs (Aquatic Visitors Center, outreach campaigns on Aquatic Invasive species, workshops, conferences, webinars, press conferences where OHSG is involved appear to be very successful in creating a stronger conscience of Lake Erie's functional values.

The Program Performance Measures are two (2) in total. The Program Plan Target was exceeded in both (100%). All seven (7) Program Objectives were achieved (100%).

2015 Performance Review Panel Summary for

Ohio Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

The program has had limited contributions to new technologies and much effort is devoted to public outreach and educational initiatives directed to Lake Erie. Scholarly contributions cannot be evaluated. Many stakeholders have been reached by visiting educational facilities so numbers reached are high and admirable. There is limited information on any changes resulting from exposure to information. There is good networking with other SG programs on AIS issues and commendable work to update and rewrite the OH Comprehensive AIS Management Plan and Rapid Response Plan as well as coordinated education and outreach materials that is ongoing. Following federal approval the Plan will be implemented by state. Program has developed 23 college credit courses and training on fish sampling techniques for persons seeking jobs in natural resources field.

The program has targeted educational efforts to charter captains and sports fishermen that contribute \$1B to local economies. Most efforts are educational forums, habitat restoration to enhance fisheries and research to improve stocking strategies of steelhead to maximize returns to native tributaries. The economic implications are not clear. Work on developing a new rapid diagnostic for VHS shows promise but no commercial kit yet or any information on validation by USDA-APHIS. Efforts to support the aquaculture sector are limited with most work done by OSU and not SG. Program is active in partnering with others to reach and benefit broad audiences such as the Lake Erie Literacy Principles serving as a model for Great Lakes. Program leveraged \$415,434 to support program's goals.

2015 Performance Review Panel Summary for

Ohio Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

With a modest budget of \$1,052,884 OHSG has maximized its impact in the areas of science and technology at the state and regional levels by aligning its priorities with that of the Great Lakes Sea Grant Network. Research cited indicated strong connections with management and extension components, with walleye and yellow perch genetic analysis already being incorporated and applied to management. Research on steelhead has also being applied by managers both in Ohio at the state level, with additional impacts at the regional level including application by hatchery managers in Pennsylvania. Research not only supports fisheries management, but has been target toward those fisheries most important culturally and economically in the state and region. Other research through OHSG institutions has helped establish new strains of commercially important aquaculture species, which have been adopted across the state. OHSG has also done a good job of incorporating science in fisheries education components, by utilizing scientific equipment and aquatic collection techniques in broader outreach programs. Overall the science and technical aspects of the OHSG SSSS program aspects are limited, but the program has chosen a targeted area of focus which directly ties to important management challenges in the state and region, and has allowed the research coming out of OHSG and its institutions to be directly and immediately applied to management decisions. So, while there is not a huge volume of research generated, it is generally well incorporated.

OHSG has maximized its impact and outreach to society through concentrating many of its programs with Aquatic Visitor Center. With a modest budget, focusing its efforts on program development at the center has allowed significant direct education programs in the areas of ecology and fisheries education to the general public. However, the performance outcomes seem to double count some of these education and outreach activities, by counting attendance at the AVC as both outreach of ecosystems education and fisheries. The ability to reach out to constituents directly through this Center provides more direct education opportunities (i.e. workshops, courses, and presentations as opposed to passive education through pamphlets and brochures) as well as the ability to track outcomes, and increases the scope of impacts from a local scale to a regional and potentially national and international scale by tapping into the tourism sector. OHSG has also continued educational programs, including fishing techniques, past the completion of the original program objective, indicating its prioritization of these programs and educational components. OHSG has also entered into partnership with regional and national NGOs, such as TNC and Ducks Unlimited, to facilitate wetlands restoration efforts. With a

Reviewer: Megan Mueller

Reviewer Type: 2

limited budget, engaging with other organizations allows OHSG to advance its mission and leverage manpower and resources to achieve ecological conservation. Ongoing efforts with the charter fishing industry have shown direct impacts on supporting businesses, with reach of 1/4 of captains and nearly 1/2 showing increased profitability following attendance at OHSG conferences. Collaborating with the GLSG network, OHSG has developed BMPs to prevent the spread of aquatic invasive species, and increased the distribution through the regional network. Through its accomplishments, it is clear that OHSG utilizes the regional network to both prioritize its research and extension areas of focus, and also distribute results and education components. The network here seems to allow leveraging of modest budget, rather than allowing the Program to ride the coattails of others in the region.

2015 Performance Review Panel Summary for

Oregon Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

OREGON SEA GRANT EVALUATION FORM: VANCE P. VICENTE

Oregon Sea Grant Program is a statewide program headquartered at Oregon State University. Commercial fisheries landing are between \$150 and \$189 million /yr. OSG bridges gaps between scientist and fishers: a concrete example is CROOS (Collaborative Research on Oregon Ocean). The Oregon Strategic Plan three primary goals: 1) improving human health, 2) promoting social progress and economic viability, and 3) enhancing sustainability of coastal ecosystems.

The Oregon Sea Grant Program has four (4) goals. Program Goal 1 (A sustainable supply of safe seafood to meet public demand at affordable prices) has three listed impacts: Oregon Sea Grant worked with tribal members and the Columbia River Intertribal Fish Commission to conduct food safety workshops and to develop commercial production and created Oregon Department of Agriculture Advisory Board for strategies to develop aquaculture projects in the state. In addition OSG worked with Oregon Seafoods a new company to develop custom processing of locally caught Tuna and salmon with much success.

Program Goal 2 (a healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly and efficiently) has seven (7) impacts listed. The program worked with data-poor species population dynamics and made a major finding regarding the occurrence of “magnetite chains” in the snout of salmon and steel heads making them capable of using the earth magnetic field for navigation with significant local, national and international consequences. Other work related to pathogenic bacteria impacts on oysters and mussels were significant. Accomplishment on nearshore fisheries stock assessments were locally important. Other accomplishments (e.g. on pathogenic bacteria) under Program Goal 2 have significant local and national implications.

Program Goal 3. (informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries who appreciate the health benefits of seafood. Under Program Goal 3 there is one impact (i.e. OSG educates commercial fishers) and four Accomplishments (e.g. Oregon Sea Grant helps communicate fisheries management principles and practices using a novel multimedia approach). In addition important accomplishments include OSG help in making make radioactive data from the FUKUSHIMA nuclear plant disaster in a non-alarming way. All accomplishments were relevant to program Goal 3.

Reviewer: Vance Vicente

Reviewer Type: 1

Program Goal 4 (OTHER-Safe and Sustainable Seafood Supply Goal) has 1 impact (Oregon Sea Grant partners with Oregon Coast Community College to develop the nation's first training program for professional aquarists two relevant accomplishments listed.

In total, there were 16 Program Performance Measures of which all 16 (100%) very notably exceeded the Program Plan Targets. Of the 31 total objectives of the program, 30 (97%) were achieved.

2015 Performance Review Panel Summary for

Oregon Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

Program has made significant contributions to improved resource information and improved communication among stakeholder groups:

- It organizing innovative data collection and research activities between fishermen and scientists that improved data collection used in stock assessments for salmon and groundfish
- Evaluated potential application of simple assessment tools and vulnerability analysis for management of Oregon's data poor fisheries
- Found that a mutant strain of *Vibrio tubiashii* and other bacterial products are toxic to oyster and mussel embryos and developed a better method for vibrio screening
- Program produced seven peer reviewed publications and technical documents for fisheries managers

Program also developed a retortable pouch, a state of the art tuna canning process that improves product quality over traditional canning technology

Program provided significant benefits to the management and uses of Pacific resources through its collaborative research, technical assistance and educational programs as demonstrated by number of reported performance measures that exceeded their planned amount by wide margins.

Notable examples are:

- Identifying new seafood alternative-marketing approaches (AMA) to increase resilience and sustainability of community-supported fisheries, emphasizing helping fishers learn about alternative marketing and identifying approaches appropriate to local fisheries.
- Based on interactions with OSG's Aquatic 65 total facilities initiating use of best health practices within the ornamental fish industry. Implementation of such practices has led to healthier and better-quality ornamental fish for sale to the customer. In 2011, OSG observed a 21 percent decrease in morbidity and mortality among ornamental fish imported into Oregon. A total of 10 new or improved

Reviewer: Bruce Morehead

Reviewer Type: 2

sources provide healthy, sustainably produced/collected ornamental fish, including 7 U.S. and 3 international suppliers.

- Since 2010, 38 new Oregon seafood products have appeared in markets, with more than 230 new distribution points for Oregon fish, including local grocery store chains
- Helped establish an Oregon Aquaculture Advisory Board, which meets on a regular basis to determine the potential for expanding aquaculture in the state.
- . OSG leadership in safety training for commercial fishers has led directly to

Saving the lives of fishers. In 2010 the fishing vessel Michelle Ann caught fire. Six persons were onboard and they had recently been through drill-conductor training and responded calmly. As a result, the vessel was able to make it back to port without any serious injuries. Captain and crew stated that it was the training offered by OSG and the USCG that saved their lives and the vessel.

2015 Performance Review Panel Summary for

Oregon Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Oregon Sea Grant received \$2,358K in SSSS funding from the national program.

ORSG research identified shellfish pathogens in aquaculture facilities, helping to protect a \$110M industry, and has identified ways to reduce disease outbreaks.

Other research has focused on ocean acidification and its impact on the shellfish industry, water flow modeling, and research in shellfish diseases and their impact on shellfish growth and survival.

ORSG works extensively in the area of seafood processing, helping to develop new processing methods and packaging.

Research contributed to improved knowledge about stock assessment methods for data-limited fisheries, the Pacific albacore fishery and environmental drivers of seasonal trends, and determined that wild salmon use the earth's magnetic field for navigation.

[Note: The overall amount of research in the report seems light, particularly as some of these items seem familiar from the review 3 years ago. It's hard to evaluate the efficiency and effectiveness of the research program since the relative amount of the overall budget spent on research versus other activities isn't available.]

ORSG works to bring diverse groups together, including crabbers and tow boat operators, collaborations between fishing and non-fishing groups, the Scientist and Fishermen Exchange (SAFE) program for collaborative communication, and cooperative research programs such as Collaborative Research on Oregon Ocean Salmon (CROOS).

CROOS has helped establish the origin of chinook salmon caught off the Oregon coast, which is important as some stocks are ESA listed.

ORSG helped develop a State Aquaculture Advisory Board to promote further development of this rapidly growing industry.

Reviewer: Galen Tromble

Reviewer Type: 2

ORSG has contributed to ocean literacy efforts in Oregon schools, including incorporation of new fisheries knowledge, and received a Presidential Coastal America Partnership Award in 2010, and the school district received a statewide Excellence in Curriculum Leadership Award.

ORSG met or exceeded 16 of 16 performance measures, and achieved 30 of 31 program objectives.

2015 Performance Review Panel Summary for

Pennsylvania Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 4

This is a relatively new program established in 1998. However, this program is now 17 years old and while there is considerably less coastal area than other states, it appears to be struggling to find an identity. While it seems to have focused on very specific goals which are certainly relevant to PA and to NOAA and the nation as a whole, the strategies selected appear not match the actual goal. For example, goal 1 is to play a role in understanding the seafood problems (undefined) and opportunities (undefined) and the strategy is to assist the aquaculture industry to become more competitive. While the strategy is relevant and would contribute significantly through advancements in science and technology, it appears to be a mismatch with the goal which is fostering an understanding of problems and opportunities in management. Underscoring how this appears to be a mismatch there is no accomplishment that describes how they have helped make aquaculture more competitive in PA. In fact, they have invested their energies in working with local communities to remove barriers to steelhead migration by implementing fish ladders. So breaking this down, the use of fish ladders and finding funding is extremely worth while in supporting recreational angling. So with this, rather than assisting with aquaculture, they are assisting with recreational angling in itself significant and worthy of support. The plan needs reflect what they truly think they can accomplish and what they consider their priorities. They need to implement a process that identifies the most important issues and then what they can realistically accomplish. The second goal, that of informing consumers regarding ecosystem health and seafood safety and sustainability, they have implemented a program that based on their metrics, has been highly successful and targets underserved youth in the Lake Erie and Delaware regions. This program has had 577 participants including students and teachers with a focus on fisheries science and aquatic ecology. This program clearly needs to be continued and does match the goal and strategy of informing the public. While there are 7 program objectives, 3 have been met and one of these was met by determining that it is not feasible to establish an aquaculture technology center. The other 3 not met were due to a lack of funding. It appears that overall, the plan identifies goals and objectives that were out of reach for the program. However, at the same time, PASG has grown in both funding and in staff. Perhaps by stepping back and focusing on a couple of key issues will lead to greater success than they have achieved over the period 2009-2013. The FLY program is laudable and appears to be successful and should continue.

Reviewer: Nancy Thompson

Reviewer Type: 1

While the program has laudable goals, it is unclear where these goals were derived and how they fit into priorities for sustainable and safe seafood in PA. Clearly a strategic plan that is a realistic plan that focuses on state priorities is needed and one that has achievable goals using realistic strategies to achieve objectives. The metrics for the performance of these objectives are appropriate; its the objectives themselves that need to be realistic given the size of the program. While PASG should have a significant impact and presence in Lake Erie, there appears to be little or no collaboration with the other Lake Erie states of NY and Ohio. The extent of Lake Erie in PA is considerable and PA should have a lead role in research, education and outreach in this region. The implementation of a fish ladder is a successful project that seems to have improved the numbers of fish migrating upstream. What other problems, impediments, can be identified? What are the potential solutions? How can they work with NY, Ohio and Canada to implement improvements? It seems like this program has tremendous potential to impact the region and internationally through collaborations with other states and Canada. At the very least there should be recognition of an effort to work in collaboration with the other states and Canada.

The FLY program, educating underserved youth, has probably had an impact although there appear to be no methods for evaluating the success. However, the number of participants in the program is a measure of success in itself as it far exceeded expectations. This perhaps was via word of mouth amongst schools and teachers who wanted to offer a unique opportunity to their students who may have never had this opportunity. This has been and will continue to be successful and is an innovative approach that currently probably has had an impact at the local and regional level but could be applied to have an impact at the national level.

Reviewer: Gary Jensen
Reviewer Type: 2

2015 Performance Review Panel Summary for
Pennsylvania Sea Grant
Safe and Sustainable Seafood Supply

DRAFT Rating: 4

The program has limited funding dedicated to SSSS and thus contributions and science and technology contributions are few.

The accomplishments and outcomes do not match well with the goals and strategies referenced under SSSS in state strategic plan and numerous program objectives were not addressed because of lack of funding meaning extramural not intramural funds.

The primary accomplishment was installation of a fish ladder and bypass structure that expanded natural migratory habitat for steelhead trout. This action should create more fishing opportunities and improve this fishery over time with more fish migrating further upstream. The program has a website for program information but no data on downloads or unique visits.

The FLY program reaches a large number of underserved youth, and some parents and teachers with hands-on with goal to enhance lifelong outdoor recreation skills. There is no data on evaluation of program.

2015 Performance Review Panel Summary for

Pennsylvania Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3.5

The program did not list any goals or performance measures directly related to advancing science and technology. Additional focus on science related to ongoing projects (such as Fourmile Creek stream improvements) would increase the robustness of these efforts and provide additional tracking measures to determine the success of dam removal or stream enhancement projects. The role of PASG up to this point has primarily been one of facilitating funds and coordinating with other agencies - given the limited budget in this area, PASG is unlikely to directly focus on scientific and technological advancements, however grant funding and coordination efforts could be expanded from the emphasis on physical projects to include more research and technology focused initiatives. With a very limited budget, PASG has had to choose where to focus its SSSS initiatives, and has not been very involved in scientific and technological aspects to date. The overall Program's impacts are primarily local in scale, but in terms of scientific and technological advancement the impacts are none to limited.

Given its limited budget, the Program has been smart to focus on a few key areas and limit itself to projects with local and regional impacts. The FLY program has exceeded its target audiences, but it is not clear how benefits of the program extend beyond the participants themselves. Funds have not been available for or directed toward information about aquaculture, science-based fish consumption education programs, or sustainable seafood professional development. Doubtless, the FLY program engenders a sense of environmental stewardship and interest in recreational angling, but its description represents a tenuous connection to seafood safety and consumption. With an established recreational angling industry in the area, focusing on aquaculture or other areas which have unmet needs and are directly related to program objectives is advisable. With 0% of participants in workshops improving their fish consumption patterns (and only 12 overall participants), no impacts can be determined.

2015 Performance Review Panel Summary for

Pennsylvania Sea Grant

Safe and Sustainable Seafood Supply

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2015 Performance Review Panel Summary for

Rhode Island Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

With regard to the SSSS focus area, RISG's contributions to science and technology were focused on providing information about shellfish biology and ecology, especially as they might inform management and regulation in RI and the north east. In order to complete a review of the best available science, RISG convened a shellfish science symposium (Ronald C. Baird Science Symposium) in 2013. Critical gaps were identified and prioritized. This activity informed the next RISG RRF on the theme of Shellfish Biology and Ecology, specifically tailored to supporting ecosystem-based shellfish management. Other research already underway contributed to the understanding and consideration of the efficacy of sector allocation program for summer flounder, and the Special Area Management Plan initiative. Further research on finfish and shellfish aquaculture was undertaken from the perspectives of technical operations issues including organism health, and business processes, marketing and regulatory compliance. The RISG-supported research on juvenile oyster health by David Rowley resulted in the production of probiotics that improve disease resistance. Several patents for the approach are pending. Trials for application to commercial aquaculture operations are pending.

The areas of impact for these contributions are local, state, and regional. There is also the potential for significant technology transfer of techniques, technologies, and lessons learned to other SG programs facing similar issues across the country. RISG's primary roles are the traditional support for research, technology transfer, and outreach and education. A relatively unique capability of RISG is the contribution of the RISG Law Fellows, managed by the RISG Legal Program located at Roger Williams University School of Law. The fellows provide a unique

contribution to research and outreach efforts by undertaking law and policy analyses that complement and/or add value to ongoing efforts. For instance, Law Fellow Melissa Chalek worked with research scientist Scott Lindell, researching law, policy, and regulations related to shellfish depuration. Her research found that Rhode Island depuration regulations were excessively restrictive in light of interstate, national and international regulations, and were standing in the way of development of an economically viable business model for mussel aquaculture in Rhode Island. Her research was used as guidance by state regulators to alter depuration regulations to be less restrictive to shellfish aquaculture development.

Given the available information provided, it is difficult to determine if these contributions are commensurate with the program's relatively small size, and/or level of direct and leveraged support.

Important note: Two key RISG faculty leaders left the program during this time period which of necessity changed the nature of the SSSS program. The impacts are that efforts to build a university-wide initiative around sustainable seafood was therefore neither practical nor probable so efforts were reprogrammed. Also during this strategic plan time frame, Rhode Island Sea Grant Director Barry Costa-Pierce, the center point for multi-trophic, ecosystem-based aquaculture efforts, left the program. These departures seemed to have impacts on the strategic plan implementation and outcomes.

A general note about the program performance measures: there have limited utility in many instances, and thus make it difficult to assess the actual success of a particular initiative. This is especially problematic with the economic impacts measures. This could be a result of the reporting method used and the relatively simplistic explanations given. For example, the first measure - "Economic (market and nonmarket) benefits (\$) derived from the discovery and/or application of new fishery production and management models or techniques that lead to increased sustainability and productivity from the fishery" - has a number reported that is not clearly explained and bears no obvious relationship to program comments. In fact, the reporting for the second plan year indicates that they are "currently unable to calculate/quantify a true figure with surety and so are under reporting a value as we cannot verify full value," which calls into question the validity of the initial year's estimate. A number of the measures suffer from this issue. There are also issues with showing a clear nexus or casual relationship between the measure and the program's actions. Finally, the organization of the program objective table was very awkward, and made it difficult to evaluate program objectives over the duration of the strategic plan. In several cases the determination was "yes," but the comments provided did not support it. As I discuss below, the program plan and intent is admirable, but it is difficult to evaluate the actual successes and put them in the context of the overall investment. My answers to the evaluation considerations largely rely on the assertions and conclusion made by RISG in the PIER report.

In addition to the overarching societal benefits of well-managed (EBFM, with co-management processes) sustainable fisheries, sustainable aquaculture production to relieve pressure on wild stocks, Rhode Island Sea Grant extension experts report that they are working closely with state agency and industry representatives in 2015 to develop strategic avenues for increasing the consumption of local seafood species locally and regionally, through branding and marketing. RISG is also helping commercial lobster fishers to explore diversification of their industry into 'working tourism.'

For the goal of increasing capacity of the seafood industry to ensure that safe seafood product gets to consumers, a significant accomplishment was made in the partnership with the East Coast Shellfish Grower's Association. With Rhode Island Sea Grant Program Development funding, the association produced and distributed safe shellfish handling instructional materials, then followed up by convening workshops with handlers. The result of this outreach and education effort was that it stopped the implementation of new Food and Drug Administration handling procedures for shellfish handlers. In addition, a new benefits and risks of seafood consumption website was launched.

Reviewer: Steven D. Giordano

Reviewer Type: 1

Economic benefits realized include increasing commercial fishing revenues by supporting optimized or innovative regulatory schemes, creating technical innovations to aquaculture production processes which lower costs and reduce waste streams, and building the mussel aquaculture sector in RI.

Management of natural resources has been improved. For example, the Law Fellow Melissa Chalek worked with research scientist Scott Lindell, researching law, policy, and regulations related to shellfish depuration. Her research found that Rhode Island depuration regulations were excessively restrictive in light of interstate, national and international regulations, and were standing in the way of development of an economically viable business model for mussel aquaculture in Rhode Island. Her research was used as guidance by state regulators to alter depuration regulations to be less restrictive to shellfish aquaculture development. Law Fellows are available to provide valuable law and policy research to other Sea Grant programs that do not have a dedicated legal program. This also provides more opportunities for partnering the Rhode Island Sea Grant program with other Sea Grant programs, including those in the

Northeast Sea Grant Consortium.

The areas of impact are primarily local, state, and regional. RISG's role is research, technical and legal assistance/extension, (communication) outreach and education. RISG communication activities include lecture series, workshops, classes, symposia, online media, and printed periodicals.

2015 Performance Review Panel Summary for

Rhode Island Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

The program takes a proactive approach to addressing stakeholder needs and critical issues through science discoveries and technology development projects. An emerging oyster disease is being investigated to assess the life cycle and risks that could impact farmers from this endemic pathogen. A patent on Intellectual Property for a probiotic bacteria for marine aquaculture was filed that indicates an innovative discovery with commercial implications. Continued research on gear modifications to reduce by-catch in commercial fisheries can contribute to management applications and has local and international implications. A proof of concept project is demonstrating that a nuisance algae can be integrated into oyster farming through a multi-trophic approach and result in a new value added product for human consumption (Gracilaria). Work to develop a new survey method to improve scup stock assessment has implications for fisheries managers. There are numerous cases of research being completed but no indication of outcome or adoption for public value. This lag time from discovery to commercialization can be long and in many cases the research contributes the foundation of knowledge that starts the process.

The program is leading a major shellfish management initiative that has implications on the state's Shellfish Management Plan and further growth of this seafood sector. Research on a pilot catch share program for summer flounder increased fleet wide revenues by \$800K. Research on state's depuration rules for shellfish grown in closed waters revealed overly strict requirements and resulted in new changes that can remove barriers to new mussel aquaculture. This raises new economic development opportunities. Research on fisheries certification schemes indicated no clear economic benefit to fishermen, thus a potential cost savings. The use of legal fellows has resulted in a unique contribution to provide legal expertise in the region. The legal issues associated with fishermen and lobstermen engaging in tourism as a new business model is a good example. Fifteen law fellows contributed to decision and policy making in 12 projects to provide legal research services. The purposeful outreach of "mini-conferences" and annual community lectures educates the public and inspires undergraduate students in exposure to real world research. The Science Symposium in partnership with Johnson and Wales University offered a public forum on sustainable seafood and understanding of the value chain from the ocean to the plate. The program played a key role to enroll and train 110 lobstermen to develop business plans and comply to receive funds from the USDA Trade Adjustment Assistance Program. This effort can contribute to longer term economic stability for this sector. The FDA stopped

Reviewer: Gary Jensen

Reviewer Type: 2

new post-harvest shellfish regulations as a result of SG funded training through the East Coast Shellfish Growers Association that met educational needs of proper growing and handling methods. Without this effort the FDA regulations would have adversely impacted the shellfish industry. This is a national impact. The program has a multi-faceted approach to supporting the fishery sector with numerous relevant projects that overcome barriers or improve technologies. There are considerable activities and ongoing work that have not resulted in measurable outcomes. There is considerable effort in training in numerous topics but little data on the outcomes or adoption of new knowledge or technologies in many cases. The program has many key partners that extend the value of the program. The Chef's Seminar is a good example of reaching an important clientele.

2015 Performance Review Panel Summary for

Rhode Island Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

This long standing and mature program is a high performing program that works directly with industry participants to produce safe and sustainable seafood. They have worked with fishermen regarding the use of catch shares as a management strategy for flounder. They have aggressively researched ways to diagnose oyster diseases quickly to prevent impacts on consumers and oyster aquaculture facilities. They are conducting research on alternative feeds for aquaculture; and establishing mussel aquaculture facilities. They are working directly with fishermen on new gear designs to minimize unwanted by catch. They are working with fishermen directly to improve data collection using on vessel electronic data recording systems. Under the goal of an informed public, they host annual science symposia, some of which are geared to non scientists. They train fisheries processors and aquaculturists in HACCP implementation to insure the health of the consuming public. They have a monthly magazine that highlights what RISG is doing and has accomplished. They appear to be able to apply funds directly to help solve controversial fisheries problems in a way that appears to optimize the application of these funds. They have been able to successfully leverage funds with extramural funding from other state and federal agencies. Their gear design and by catch reduction programs are renowned and their expertise is sought after both from other states and other countries. They consistently exceed their performance metric targets by a considerable amount. I am confident that much of what they have supported has been published and it would be nice to see the number of publications that have resulted.

This program excels at working with fishermen to develop new management strategies; new gear; new aquaculture fisheries; new data collection techniques; which all can and have had positive and direct impacts on the fisheries, fishermen and consumers in RI. The gear innovations and development of alternative feeds for aquaculture production, are nationally and internationally recognized. RISG gear staff are sought after to provide advice to fishermen in other states and other nations. The impact of their research, education and outreach is at the local, state, regional, national, and international scale. The management of aquaculture fisheries and the feasibility of new aquaculture species can be explored because of the use of alternative feeds to support the fishery. Because these are alternatives to the use of fish to feed aquaculture species, improves the perception and acceptability of aquaculture to opponents who object to the use of fish to feed aquaculture species. They note that their work has increased the number of employees in fisheries and in particular employed in the aquaculture sector. This program is a valuable asset to the state and the nation.

2015 Performance Review Panel Summary for

South Carolina Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

Some of the research projects named as performance measures were highly technical. It was not always clear that more broad biological and genetic research which can be applied to fisheries has truly direct impacts, at least at this stage of research. Many publications were listed in the performance measures, however there was not a clear indication of how the knowledge gained during this research has been extended and applied, or adopted by managers. More closely drawn connections to fisheries and seafood in particular should be made with some of the research projects. It is also unknown whether many these projects have been adopted and applied by other scientists in the disciplines or extended in future studies. However, research on planktonic egg quantification transferred to industry and embraced by end-users presents a strong basis for the type of outcomes that are possible from some of the advanced genomic and technical research sponsored by the Consortium.

Beyond the realms of science and technology, SCSG has proven itself to be a trusted resource in the state and region. For 20 years the Consortium has hosted the International Conference on Shellfish Restoration, demonstrating support for partnerships and expanding its scope from state and regional to international impacts. The Consortium has undertaken research to expand the impact of tourism to the SC seafood industry, and the focus not only on moving forward with the SC Seafood Trail but also to identify barriers show foresight needed to establish a complicated program. The program's response to the 2014 oyster seed import moratorium demonstrated its nimbleness and ability to prioritize the needs of its stakeholders by meeting the needs of all existing and new growers for oyster seed from previously unused sources. This is one example of how the program clearly understand its niche role not filled by existing state agencies or academia. The program's selection as fiscal administrator for the Governor's South Atlantic Alliance Executive Planning Team shows regional recognition and leadership, expanding the program's scope of influence. Its involvement in USDA Trade Adjustment Assistance programs with SC shrimpers illustrates local-level commitment to helping commercial fishermen take advantage of federal assistance programs and the development of business plans to sustain local fisheries in the face of international competition. The consortium's social media guide is now being shared on a national basis, and this product indicates a forward looking tool to help bring the industry into the modern-day media age, often a challenge for small businesses and government agencies. New initiatives in community supported fisheries also support this future-wise approach.

2015 Performance Review Panel Summary for

South Carolina Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Program had excellent alignment between its Strategic Plan objectives and its performance measures which were merged with program objectives in its PIER report. Documented its scientific, technical, and educational products and its reported number of 32 exceeding its target of 20. However some of the results of its fisheries and aquaculture research accomplishments were not directly linked to program performance measures. Program had state, regional and national impacts. Its cooperative research with VA on the use Triploid and Diploid Eastern Oysters work with the ILL MarketMaker web based tool, and development of a Social Media Guide have made contributions regionally and nationally. Program has provided fishery researchers/managers with new way to handle large amounts of data associated with genetic sequencing, a model on the impact of drought on SC blue crabs, and a rapid cost efficient molecular tool to identify species genetic differences.

Program has provided the following major benefits;

Though its research extension and outreach efforts, program had a major impact on the growth of the SC shellfish industry: In response to a state moratorium on oyster seed from points north of South Carolina announced in April 2014, the Consortium worked with SCDNR shellfish managers and private growers to identify acceptable seed sources from points south and then provided technical training on remote setting techniques to the growers. This resulted in over three million seed, valued at over \$60,000 sold in the state in 2014, meeting the needs of all existing growers and supporting the establishment of five new operations. In 2014, industry doubled in size and growers are beginning to hone techniques they were first exposed to during Sea Grant-led demonstrations

2015 Performance Review Panel Summary for

Texas Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2

This is a large program that is hosted by Texas A&M and it seems as if there is little or no collaboration or inclusion of other Texas universities in this program which is curious. On the other hand, Texas A&M has a considerable amount of expertise in diverse disciplines but it cannot possibly be exclusive of all other state universities and colleges. In fact, incorporating more schools will expand TSG's reach to include the entire state. Saying that, TSG has focused appropriately on the most important SSSS economic drivers: the shrimp fishery; red drum recreational and aquaculture fisheries; harmful algal blooms; unintended by catch; informing the public about seafood safety. They state that a number of significant publications have resulted from the research they have supported directed at achieving the goals of a safe seafood supply; a sustainable seafood supply; and an informed public. Their strategies have been to work in collaboration with the fishing and aquaculture industries which has been highly productive. TSG has worked with commercial shrimp fishers to improve their efficiency and reduce operational costs particularly when faced with increasing fuel prices. TSG continues to work with the commercial shrimp fishery to develop and test new fish by catch reduction devices to minimize the catch of unwanted fish species. In developing and testing new BRD's TSG worked with NOAA and other Gulf states to develop new devices that achieve both the goal of reduction in by catch and retention of target catch. TSG continues to work with the state to alert the public about the occurrence of HAB's and has been recognized for its ability to communicate this information quickly and effectively to the public. TSG worked with the GSMFC to develop an innovative population modeling approach to evaluate the status and productivity of the Kemp's ridley turtle, which is considered by some Texas' sea turtle. Recognizing that NOAA was not conducting assessment of turtles, TSG filled this important information gap to provide science advice for management. TSG pioneered the successful development of red drum aquaculture making it available as a seafood product to consumers. In a public survey they determined that 50% of the public appear to be informed and are concerned about the sustainability and safety of their seafood and include this information in their choices of seafood. This is a result that TSG is building upon. One area where they admit they may have been overambitious is in the development and siting of offshore aquaculture. This objective was not achieved only because the issue of offshore aquaculture has yet to be resolved at the national and regional level. Therefore they could not move forward in development of best practices for this fishery. TSG works with and will continue to work with the other Gulf states through formal and informal relationships and organizations and plans to expand this collaboration. Given the oil disaster in the spring through summer of 2010 and the appropriate change in focus for TSG, it is remarkable that they have been able to accomplish what they have as the oil

Reviewer: Nancy Thompson

Reviewer Type: 1

disaster impacts continue to linger and require attention. During this disaster TSG focused efforts to inform the public about the safety of seafood and while there was a decrease in consumption it was temporary and TSG received a considerable amount of praise from the fishing industry in helping them continue to exist. The objectives that TSG focused on are absolutely the right ones for Texas and they have been extremely successful in meeting or exceeding these objectives. Much of their research, e.g. gear research, HAB research, aquaculture best practices, directly impact Texans quality of life and has either sustained or improved this while also sustaining or improving the overall economy of the state. I wonder how much greater TSG could be if it collaborated within the Texas state university system? Certainly outreach using regional campuses or other universities could increase as more of the public could be reached directly.

The focus of the TSG program has been on recovery and sustainability of the shrimp fishery; safety and expansion of aquaculture; HAB's; seafood safety during and after the DWH oil disaster; and recovery of sea turtles. All of these have significant impacts on the quality of life of all Texans and on the economy of Texas at the local, regional and state level. TSG solutions for improving the efficiency and sustainability of the shrimp fishery; gear technology solutions to reduce unwanted by catch; and the education of the public regarding seafood safety from both wild and aquaculture products are transportable to other regions, states, and internationally. The TSG is an extremely focused program which has invested in research that has resulted in practical solutions which have essentially saved the inshore and coastal shrimp fishery and expanded opportunities for recreational anglers. The results of this program are far reaching and remarkable and have directly impacted the availability of seafood, shrimp and red drum especially, to local, regional and national markets. Their research on red drum aquaculture has been a huge success and expanded the consumer market for this species. Their work with the state agency to alert constituents to the occurrence of HAB's is a significant public health achievement. The development of an innovative method to assess the status and health of the Kemp's ridley sea turtle effectively provided science advice for the management of this endangered species. All of these solutions and research results are directly impacting the lives of all Texans by insuring that safe sustainable seafood is available to them. These are all direct and noteworthy contributions to society

2015 Performance Review Panel Summary for

Texas Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

Research revealed the potential threat of contaminants of concern found in waterways. As population increases this threat can pose hazards to fish along the TX coast. Study provides baseline data for future monitoring. Program field-tested a by catch reduction device that is being used in other states and subject to formal certification trials by Gulf and South Atlantic Fisheries Foundation as new technology. Research resulted in change of feeding regime for red drum at two state restoration hatcheries resulting in reduced costs and improved larvae for restocking program Program developed Imaging FlowCytobot for detecting HABs and predicting events for closure of oyster harvesting to prevent recalls and protect human health. Program funded evaluation of new tool (LISST) to detect HABs in a simple and cost effective manner.

The development of video about seafood and its origins was actually referenced on shrimp packaging. TX launched the MarketMaker tool to link consumers to local seafood supplies for direct marketing. Improved technologies in fuel efficient trawl gear saved fleet millions of dollars thus enhancing the profitability of this sector. Program led regional project for Gulf shrimpers to gain payments and develop long term business plans through USDA Trade Adjustment Assistance Program. This effort was significant with more than 4,000 applicants completing program for full payments of about \$45M. Program conducted international short course for farmed shrimp and finish aquaculture with excellent ratings that reflects prestige of program. Program provided technical assistance to shrimp fleet to adopt new by catch reduction device with 90% adoption rate because of effort. TX joined other Gulf SG programs to support Gulf of Mexico Research Plan that resulted in additional funds and new tools and programs benefitting 72 coastal communities in region. Program reached and informed public about Fish for Health Advice with partners through 40,000 copies. Program addressed public concerns about oil tainted seafood from Deep Horizon serving as "point of contact" for university on communications of science and received Newsmaker Award for program's communication response to oil spill issues. Region wide project developed cost effective handling recipe for shrimpers to increase percentage of top quality product for price premiums in market through on-vessel demonstrations. The development of virus-free white shrimp offers new economic opportunities in live bait sector including economic feasibility. Program assisted Gulf of Mexico Fisheries Management Council develop a regulatory framework for permitting offshore aquaculture in federal waters with significant implications when final rule is completed by NOAA. Program trained 77 TX Coastal Naturalists to be Red Tide Rangers and aid in

Reviewer: Gary Jensen

Reviewer Type: 2

monitoring HABs. Consumer survey indicated people aware of seafood safety issues and recognize sustainability. The program has met its strategic objectives in state plan and used resources effectively in research, outreach and communications to benefit the public.

2015 Performance Review Panel Summary for

Texas Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Texas Sea Grant received \$1,701 from the national program for SSSS.

TXSG placed the SSSS focus area within its overarching goal area of “coastal communities and economies” in its 2009-2013 Strategic Plan. Strategies are concentrated on aquaculture and seafood safety and quality with goals to improve seafood quality and fuel-efficiency of seafood harvesting enterprises; developing technologies to produce new species for enhancement stocking and commercial aquaculture in the open ocean; and addressing hazards such as invasive species and harmful algal blooms.

TXSG research has been instrumental in developing an aquaculture industry for red drum, worth \$9M annually. Other research has led to important insight about the relative impact of environmental conditions and fishing on shrimp abundance, finding that modest changes in juvenile growth and mortality may outweigh all of the effects of fishing.

Another study of potential wider application, also conducted on red drum, demonstrated that fishmeal, which is in high demand worldwide and expensive, can be replaced by at least 50% with less expensive plant-based feeds.

TXSG research improved prediction of harmful algal blooms, and helped state and federal agencies act quickly to safeguard public health.

In an important emerging area of ecological and human health concern, TXSG funded a study to determine levels of pharmaceuticals and other contaminants of emerging concern in Texas waterways, and study their impact on fish and other aquatic animals.

TXSG has focused on the shrimp fishery, the State's largest fishery and one that has suffered from many pressures in recent years. TXSG led efforts to include the shrimp fishery in the USDA TAA program, and developed curriculum provided training as required for fishermen to receive assistance under the program.

Reviewer: Galen Tromble

Reviewer Type: 2

TXSG research and technology transfer of fuel-efficient trawl technology to the shrimp fishery has helped hundreds of vessels save more than \$51M in fuel costs over a 7 year period.

TXSG efforts have supported the aquaculture industry, recreational fisheries, and seafood consumers.

TXSG met or exceeded 3 of 5 performance measures and achieved 21 of 24 program objectives. One of the unmet objectives related to marine offshore aquaculture, and could not be achieved due to delays in implementing a federal FMP and regulations to permit offshore aquaculture.

2015 Performance Review Panel Summary for

University of Southern California Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3.5

This is a new focus area for USCSG from past strategic planning periods which was attributed to recent developments in California related to designation of marine protected areas, research findings on the importance of seafood to healthy diets, and advances in aquaculture technology have fostered interest among our constituents and stakeholders.

The performance measures were met, but the measures were relatively weak and low bar. For example, exceeding the number of consumers who indicate increased knowledge of seafood (260) is not a challenging performance measure in an urban area the size of Los Angeles. One mass email or news release could surpass this figure. Although there were statements that knowledge was gained during workshops. There were too many statements like "Educators gained knowledge about SSS during educator outreach" without supporting evidence. The 37 journal articles number listed for this focus area is quite impressive given the size of the investment.

Many of the listed accomplishments had potential, but were not completed. For example, it was mentioned the self-cleaning aquaculture tank design could greatly improve larval survival rates for three types of fish, however it was still in the research phase.

Research to test the accuracy of using portable veterinary ultrasound technology to determine halibut gender identified a new method that proved accurate and nonlethal. This technique "will" enable CAF&G a new method to sample halibut, but it is not clearly stated whether or not Fish and Game is actually using the technique.

Research to determine the extent of endocrine disruption present in fish in Southern California has developed a new technology – proteomics - that maps all proteins expressed in a given tissue. the method is faster and more cost effective than traditional screening methods and the technology has already been shared with environmental managers, policymakers, and in an aquarium exhibit reaching the fish consuming public. This information has already informed the Orange County Sanitation District of changes that "could" be made to its regular regional monitoring efforts, and this information is being shared in other venues with managers, policymakers, and even the public who consume the fish through an exhibit in the Cabrillo Marine Aquarium.

Reviewer: Jim Murray

Reviewer Type: 1

Student (14) led barotrauma outreach was provided to anglers on local two sportfishing vessels, resulting in behavioral changes of anglers. Outreach (a test brochure was distributed) was also provided to the school's fishing club and to more than 600 attendees at the Fred Hall Fishing Show as part of NOAA NMFS's booth. Several attendees inquired where to purchase descending devices.

2015 Performance Review Panel Summary for

University of Southern California Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

This is a small program that recognizes that the coastal economy of California particularly in the south, is based on shipping. Because this region is highly urbanized, this program focuses to some extent on the impact of this urbanization on coastal waters and resources. This is an appropriate focus and as they say, as more and more people move to the coast throughout the US, their issues will be the coastal issues of the future elsewhere and they can provide valuable lessons learned. Two major areas of focus for this program are aquaculture, and in particular offshore aquaculture; and informing the public about stewardship of coastal resources. On the fisheries front, they have supported research to minimize mortality in recreational fisheries (barotrauma), and eliminate the need to kill halibut for sex id (this is a commercial species). With California SG they have supported research which describes how the public views the importance of fisheries and which are considered the most important. All of these provide valuable information for informing assessments of the health of stocks (halibut sex id) and for aligning research to those fisheries deemed important by Californians. Notably their outreach to the public for example, to reduce recreational mortalities have been able to reach a large number of people exceeding their anticipated participation. They support outreach on the impact of pharmaceutical products, on fish and human health. This information comes from work supported by Illinois/Indiana SG. This appears to be a focus area for the future and given the extent of urbanization of the southern California region, is an appropriate issue to engage in.

Again, this is a small program which is focused in a large urban region, which is dependent upon shipping. Fishing is not a major component it appears of the economy although tourism which includes recreational fishing and diving, is a significant component. Recognizing that much of the shift away from fishing is a result of the decline in fisheries stocks, the program is focusing on the application of aquaculture, in particular offshore aquaculture to provide safe seafood. This is a significant area to pursue that will provide results that are transportable to other regions of the US and other nations. There appears interest in pursuing the use of marine protected areas to protect some coastal areas and there is much research that can be funded to support the establishment of protected areas. Research on the discharge of pharmaceuticals on both fish and human health are appropriate for a large urban area where there is likely a large discharge of these and other anthropogenic by products. Research in this area will be transportable to other regions and nations.

2015 Performance Review Panel Summary for

Virginia Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

VIRGINIA SEA GRANT EVALUATION FORM: VANCE P. VICENTE

Virginia Sea Grant program has six institutional partners: Virginia Institute of Marine Sciences (VIMS) Virginia Tech (VT) University of Virginia (UVA) Old Dominion University (ODU), Virginia Commonwealth University (VCU) and George Mason University (Mason). By 2016 all will have research facilities on the water. The economic impact of Virginia's commercial and recreational fisheries exceed \$1 billion/yr. However most historically exploited stocks have declined due to habitat changes, water quality deterioration, and overharvesting among others. Aquaculture is the fastest growing segment of US agriculture. VASG aims to maintain a sustainable fisheries and aquaculture production.

The Virginia Sea Grant program have four Program Goals with very specific objectives discussed in the presentation. Implementation of Program Goal 1 (Advance scientific understanding of sustainable fisheries and aquaculture and support sustainable fisheries and aquaculture businesses in coastal Virginia) has resulted in 21 impacts one of which is outstandingly relevant (IMPACT 21642) which consists of a Sea Grant Patent that contributes \$28.5 million company in the production of Omega-3 Oils from fungi. Wild fish for the production of this compound is not believed to be sustainable. Alternative species for seafood production and production of triploid oysters have major impacts to society. The connection between two fisheries monitoring efforts (NEAMAP and SEAMAP) would result in significant advance of our knowledge on the fisheries resources of this region. As will be discussed, Program Goal 1 and objectives have been successfully achieved. This success also permeates in the list of Accomplishments.

Program Goal 2 (provide stakeholders with the best available science, facilitate stakeholders engagement in decision making, and advance science-to-management and technology adoption) has 12 listed impacts in the evaluation. Some of the significant impacts include VASG research on 1) the effect of high salinity on *Vibrio* to comply with FDA guidance on this disease, 2) factors affecting carbonate chemistry in Chesapeake Bay, 3) moisture content in sea scallop, 3) reduction of sublegal catch of Black sea bass, and on new tagging models. The seven accomplishments listed in the evaluation are also of very much significance to this goal, in particular ACCOMPLISHMENT 21615 (research on the estimation of increased mortality associated with the outbreak of shell disease in *Homarus americanus*). The other six accomplishments listed are of very much significance (scientific and societal).

Reviewer: Vance Vicente

Reviewer Type: 1

Program Goal 3 has three impacts and two accomplishments . The development of the automated method for determining moisture ion scallops by VIMS/VASG is a major contribution to the industry. The assistance of VASG/VT to seafood companies (temperature profiles for crabs and oysters during transport among others) is also of very much significance in meeting FDA requirements. Training offered by VASG extension at VT on Hazard Analysis and Critical Control Points (HACCP) and Good Management Practices for seafood processors also of seafood safety importance as well for compliance of FDA sanitation issues.

Program Goal 4 (Increase understanding and application of best practices in seafood safety, products and market development, and seafood-processing efficiencies) has six (6) listed impacts and two accomplishments. The VASG funded research which found that high salinities relay could reduce bacterial levels as required by FDA is of significant economic and food safety importance. The VASG extension which helped develop the Scallop medallion markrt is of economic importance and exceed \$100million dollars over produce lifetime. VASG's goal of understanding and application of best practices on seafood safety was also achieved in the development of treating scallops with 2.5% STP and 1% NACL which resulted in the lowest amount of drip loss. VASG contribution to "creating and marketing value-added seafood products of much relevance to the economy of local markets. Accomplishments 21610 (Best Management Practice workshops) has had important local impacts. In total, there were 15 Program Performance Measures (2010-2013). The PPTExceeded + PPT balanced was 12 (80%). There was a total of nine Program Objectives: 6 were achieved (66.7%) and 3 not achieved (33.3%).

2015 Performance Review Panel Summary for

Virginia Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

Specific contributions included:

Finfish aquaculture, aquaponics: Extension provided technical expertise in setting up and maintaining finfish aquaculture and aquaponics facilities, helping support a newly developing industry. Extension has developed aquaculture protocols for more than a half-dozen popular seafood species, provided training for more than 100 participants in best management practices for aquaculture, and developed an “aquaculture ambassador” program to perform public outreach for aquaculture and sustainable seafood, training minority student ambassadors and targeting outreach to lower-income, minority communities.

Shellfish aquaculture: Research and extension have been involved in the development of triploid oysters which make up 90% of Virginia’s oyster aquaculture industry, and VASG continues to fund breeding efforts to improve survival of oysters and profitability for growers.

- Research and extension investigated cooking, packaging, post-harvest processing, and other methods to reduce risk of illness from seafood.
- Extension collaborated with industry to develop new ways to market products, including marketing half-shell oysters by their growing region and providing technical expertise to develop new scallop products for market.
- Extension provided technical expertise to reduce the power bill of a start-up finfish aquaculture facility by advising on implementation of solar energy.

As described in its report, VASG had the following stakeholder and societal benefits:

Finfish aquaculture businesses benefited from technical expertise that has resulted in new species to raise, improved ability to install and manage tank equipment, reduced energy costs through solar energy, and better understanding of best aquaculture practices, resulting in 9 new species available for aquaculture and supporting millions in emerging business.

Reviewer: Bruce Morehead

Reviewer Type: 2

- Shellfish aquaculture businesses collaborated with VASG to research water quality at hatcheries and oyster traits that improve profitability, coordinate on common concerns, and improve marketing of market half-shell oysters, supporting a \$55.9M industry.
- Commercial fishermen collaborated with VASG to investigate gear modifications and new gear options, including turtle excluder devices for shrimp trawls, electrofishing for blue catfish, net modifications for reducing bycatch when fishing for striped bass, and others.
- Seafood processing businesses received training to produce safe products and jobs.
- Health officials received information about human health risks and quality in seafood.
- Land-use managers received information on disconnects between land and fisheries management and strategies to improve communication and integrated management in the future.
- Fisheries managers received information on ecosystem-based fisheries management approaches, including stock assessment data, improved coordination between fisheries surveys, disease ecology information, and data on new gear and gear modifications.
- US Congress received new information about how federal efforts to rebuild fish populations have worked and integrated findings into proposed legislation.
- Seafood consumers experienced improvements in seafood safety; there have been no FDA citations against Virginia seafood processors that participated in VASG trainings in 12 years.
- Students received training and experience in aquaculture production and outreach that support workforce development, particularly among minority students and communities.

2015 Performance Review Panel Summary for

Washington Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

The keys to the successes of the WSG SSSS program are essentially two-fold. First, the program utilizes an ecosystem approach to management, integrating ecological, economic, social, and legal/policy perspectives across a multitude of legal jurisdictions and cultural boundaries. Second, WSG takes a comprehensive, integrated approach with the resources available to them. Of course, the level of emphasis on SSSS and fisheries management is driven by the magnitude, complexity, and scope of the multitude of issues facing resource managers, industry, academia, and the public in northwest US (as described very effectively in the summary materials). Seafood harvest and associated commerce is such a massive part of the regional economy it has extremely high visibility and the need for objective science-based decision-making support. The WSG SSSS program utilizes fully 1/3 of the total program funding, and SSSS issues cross-cut all WSG/NSG focus areas (Living Marine Ecosystems, Ocean and Coastal Environmental Health, Changing Oceans and Coastal Communities, and Ocean Literacy and Workforce Capacity). According to WSG, this level of investment is linked to continued successes of WSG research proposals in aquaculture competitions, and the creation of a close working relationship with the NWFSC.

WSG research and outreach activities focus on three major goals: 1) support for shellfish aquaculture; 2) management of Pacific ocean fisheries; and 3) restoration of salmon and other Puget Sound fisheries. WSG also has a myriad of other living marine resources issues (including protected resource and essential fish habitat) to deal with. WSG activities and their outcomes have local, regional, national, and international relevance given the geography and intersection of watershed, coastal interface, and pelagic management issues.

WSG plays several roles in as it strives to meet its goals. For Supporting Sustainable Shellfish Aquaculture, WSG continues its effective partnership among growers, landowners, academia, and state and federal resource managers to promote continued economically and environmentally sustainable shellfish aquaculture. It does so primarily by supporting research, and importantly the translation and of the outcomes to 'actionable' science that supports effective management and improves production and harvest with minimal environmental and/or public health risk. These results have affected resource management decisions made at multiple levels. The highly successful geoduck aquaculture research program epitomizes the approach and its benefits to aquaculture science. The research culminated in peer reviewed articles forming the core of a special edition the Journal of Shellfish Research. Other research topics range from the impacts of ocean acidification and harmful algal blooms on shellfish

aquaculture to studies of economic and environmental challenges facing aquaculture. One effort is building and evaluating models to be used to predict ecological and sociological carrying capacity in a spatially explicit framework that will allow the modeling of location-specific effects of proposed aquaculture operations to maximize efficiency while minimizing environmental impacts. WSG supports the research and uses the outcomes to provide technical assistance to stakeholders, industry and resource managers alike.

Another major component of the focus area is Managing Pacific Fisheries in the pursuit of which WSG again brings together research, stakeholder outreach/education, and technical expertise to inform complex fishery management issues. These efforts have prevented the closure of a \$245 million fishery by creating a program to save protected seabirds from harm in fishing operations, explored pioneering efforts in ecosystem-based fisheries management via the PFMC, assessing west coast fisheries vulnerability to climate change impacts, improving habitat and stock assessments for managed species, strengthening consideration of socio-cultural dimensions in resource management decision-making, and supporting an integrated ecosystem assessment and marine spatial planning effort.

A significant number of WSG research projects have focused on restoration of salmon and other Puget Sound fisheries. The focus is on identifying and understanding the causes of decline, and developing recovery plans. Research areas are diverse and the partnerships are broad, including tribes, natural resource agencies, industry, and academia.

Safely producing healthy and high quality seafood is a major area of emphasis for WSG. WSG trains fishermen in safety, rescue and cold-water survival skills among other classes targeting recreational, commercial, and tribal boaters/fishermen. Training focused on USCG compliance, essential marine technical skills, and maritime safety make fisheries safer and more productive. These programs also yield environmental and socioeconomic benefits to the region and nation. Training in seafood quality, marketing and sales is also provided to help local fishers and associated businesses remain competitive and viable in the global and local marketplace.

Societal benefits are legion in this program, and are effectively reported in the PIER materials. All stakeholders are better informed on all major issues identified as a priority because WSG effectively targets funded research, develops useful products, strategically communicates the outcomes to stakeholders. Public health and safety have been improved in several ways (please see comments to previous question related to healthy seafood). The information, technical assistance, outreach and education, and resource management support have influenced stakeholder behavior, including that of the aquaculture industry, commercial, recreational, and tribal fisheries, and key components of the seafood services sector and finally tribal, state, and federal resource managers. In addition, seafood consumers have received information that is helping to make more informed choices relating to sustainable seafood management practices.

By design, the economic/environmental benefit spans the ecosystem. From the development and support of sustainable shellfish aquaculture, to saving a fishery and related jobs and economic production threatened by adverse interactions with protected species, the WSG program appears to have the ability to identify and take on the most important challenges facing the maritime economy of the region - especially SSSS. Cost-savings and productivity improvements are reported by WSG resulting from process efficiencies, improved training and systems maintenance, and integration of sustainable practices into business models.

Management and protection of natural resources has also improved significantly as a result of WSG research, technical assistance, outreach, and education efforts.

General comments:

- WSG supports outstanding stakeholder engagement
- Excellent use of Best Available Science when available - identified with SH input and filled gaps effectively
- excellent coordination with state/federal/regional managers and industry stakeholders
- Research outcomes of National importance (e.g., Ocean Acidification)
- Loads of products available for SH use, tech assistance offered when needed
- Pioneering efforts in fisheries management - EBFM approach
- More robust inclusion of socio-economic considerations into all aspects
- sound business practices and safety training benefits lead to environmental benefits as well
-

2015 Performance Review Panel Summary for

Washington Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1

Both wild harvested and farmed seafood are significant contributors to states economy and the state is at top for employment and economic value. SSSS has 1/3 of funds so it is an important focus area. The program receives highest total investment enabling the program to make numerous contributions of significance. The program metrics are impressive and well documented. SSSS cuts across four program focus areas in the state plan. The program has especially supported the shellfish industry with new mass spawning of oyster seed to reduce hatchery costs and maintain genetic diversity; research that combines geospatial (ecological) and survey data (socioeconomic) on shellfish aquaculture to support coastal management and spatial planning with benefit to other west coast states; effects of ocean acidification on oyster broodstock and larvae production and selection of stocks more resistant to acidification conditions with private company interested in resistant broodstock studied; new research on ecological and social carrying capacities for shellfish aquaculture production. Research also quantified the economic impacts of west coast shellfish aquaculture and entry barriers and expansion opportunities. Work also centered on responses of five bivalves to stressors and exposure to *Vibrio* sp. to assess susceptibility. Program developed peer-reviewed report on geoduck aquaculture to address concerns and guide sector forward to sustainable development. Other research evaluated geoduck effects on eelgrass and results used to set buffer standards.

Program organized Symposium on Ocean Acidification that led to Governor's Blue Ribbon Panel on topic with increased national attention and state funding. Research improved and validated first successful modeling tool for evaluating fish farm siting, environment effects and more that has wide utility for regulators and entrepreneurs. Research developed low cost, high resolution automated sensing technology to detect and measure HABs to address their threat to harvest closures. Program teams with Canada on large-scale binational research on alarming loss of juvenile salmon and steelhead and other work to strengthen conservation of Chinook salmon. Testimonials by supermarket employees trained on information about seafood to help customers make informed choices. Program helped tribal communities to use new practices for higher prices, new products to sustain economic growth. Program provided tools to west coast longline fishermen to reduce seabird deaths to low levels in AK. Efforts have improved stock assessment for Pacific sardines with new model for more accuracy and changes to harvest rules. The program made contributions at local, regional and binational levels and provides leadership in many areas of interest to the larger seafood community.

2015 Performance Review Panel Summary for

Washington Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Washington Sea Grant received \$4,152K in national program funds for SSSS, and is the largest program in this area.

WASG research has provided important new information on the causes of population declines of Pacific salmon, some stocks of which are ESA listed, and factors that could lead to their recovery. Projects have mapped significant parts of the Chinook salmon genome, helping in stock identification work and maintaining genetic viability in hatchery populations.

WASG research has studied salmon recolonization of streams following the largest dam removal project in the U.S.

WASG has conducted important aquaculture research on topics including public health-related oyster depuration, controlling invasive oyster drills, restoring native pinto abalone, and optimizing oyster cultch yields (I-17549). WASG's geoduck aquaculture research program is particularly notable, helping to support an \$80 million industry. WASG completed a legislatively directed comprehensive six-year research program in 2013 that assessed the effects of geoduck aquaculture in Puget Sound. Findings formed the core of a special edition of the Journal of Shellfish Research and are guiding state decisions on farm permits and geoduck culture expansion.

WASG has done leading edge research in ocean acidification and harmful algal blooms. WSG supports a HAB monitoring network that allows state health officials to efficiently target resources.

WASG's research program is diverse, covers relevant areas of societal concern and has regional, national and international impact.

WASG's program to protect seabirds from fishing operations has been very successful, reducing takes of endangered albatrosses by 82 percent, and has served as a model for stakeholder engagement and implementing research results into fishing operations. This program has had regional, national and international impacts.

Reviewer: Galen Tromble

Reviewer Type: 2

WASG trains more than 100 fishermen in safety, rescue and cold water survival annually, leading to documented reductions in accident and fatality rates.

Similar to Oregon, WASG has a program to help crab fishermen and tow boat operators negotiate safe lane separations, saving money in lost gear, and opening additional prime fishing grounds.

WASG has helped native tribes increase the value of their seafood by providing training in catch handling, storage, creation of value added products, and marketing.

WASG created a 12-hour training course in seafood retail to better inform workers on seafood quality so they can better inform and serve consumers.

WASG met or exceeded 2 of 2 performance measures and achieved 6 of 7 program objectives.

2015 Performance Review Panel Summary for

Wisconsin Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

Much research is ongoing or preliminary and results or outcomes have not been achieved, for example, vaccine for columnaris, VHS patent, method to detect HABs in freshwater, application of work on reducing bio-contaminants in fish-based food, and application of improved feeding of larval yellow perch. The work on determining mercury levels in farm-raised fish is noteworthy of findings but actual use and benefit by industry sector in market place are not indicated. The effort directed to aquaculture is focused on yellow perch but Bell Aquaculture that is presented as a key partner and consumer of patented year round spawning does not raise yellow perch today. The focus on aquaponics and urban aquaculture has mixed results with few actual commercial successes but much publicity and sales of systems and educational programs. Niche markets, low cost energy and facilities are key factors for success with need for economic models at different scales. The ARS program cited for yellow perch genetics and breeding work has switched to trout because of few yellow perch commercial operations in region. Much has changed since the reporting period for this strategic plan cycle. Research on fisheries and climate change revealed impact of warming waters and habitat loss that favors some species and puts at risk other native species. This can assist future management options to sustain natural fisheries.

The program has a major focus on AIS issues with boat landing inspectors and no reported cases of mussel species invasion, linkage with fishing tournaments and professional anglers with outreach to public and youth fish activities, evidence of wakeboard boats as vectors of AIS with regional and national actions to address this vector. Efforts at boat landings reached more than 50,000 anglers and boaters on ways to prevent spread of aquatic invasive species. Other efforts promote local fisheries in cook off and public tasting event with MN SG to increase awareness of Lake Superior fish. Mapping project helped prevent mishaps with entanglements between commercial trap nets and anglers and reporting on ghost nets for removal improve safety for all. The aquaponics can be a great area for education as evidenced by adoption in some urban schools and use as a learning environment to stimulate interest in aquaculture. The development of a podcast series on aquaculture has reached many as public outreach and new app for smart phones is a new educational tool to educate the public about fish identification. Efforts in new Eat Wisconsin Fish campaign unites many in the seafood businesses with consumers to help market more local fish. At the international level, program developed a risk assessment model of toxicity of full spectrum of dioxin-like compounds in wild fish populations that was adopted by World Health Organization.

2015 Performance Review Panel Summary for

Wisconsin Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

Overall, WISG invested \$2,354,873 in SSSS during the reporting period. Pier listed ~22 unique impacts and four unique accomplishments and multiple listings by program goals. WISG's Support Sustainable Fisheries and Aquaculture focus area has three goals has three areas of emphasis, (1) fisheries, (2) aquaculture and, (3) education and outreach.

WISG provided excellent documentation for its claims of impacts and accomplishments, which suggest the program prioritizes evaluating its efforts. Most of the program objectives have been met or exceeded (sometimes greatly) and there was very good rationale provided for why some objectives were not met during the reporting period, e. g., the use of focus groups that who'd that more workshops for supermarket managers that focused on safe seafood needed to change to a focus on local sourcing. The economic value (\$120,194,055) and number of jobs created (328) in the aquaculture industry is most impressive. I agree with the recent conclusion of the WISG site review team that WISG's aquaculture work is a best-management practice.

Overall, there is ample evidence of WISG research leading to advance in science and technology programs. Two pending patents have resulted from WISG research. At the University of Wisconsin-Madison, a team has come up with serological diagnostic tests for the viral hemorrhagic septicemia virus that are faster than current testing options. Another team determined how to attack the *Flavobacterium* bacterium by disrupting the secretion system so the cells would lose motility, attachment properties and virulence. Other researchers have examined blue-sac syndrome and can now provide hatchery managers and aquatic toxicologists with a framework to predict how organic contaminants enhance heart defects that can lead to the syndrome in feral fish populations. Still other researchers secured a U.S. patent on a process to manipulate light and temperature to cause yellow perch to spawn out of season.

An assessment of climate change impacts on the Lake Superior food web siscowet lake trout have lost about 20 percent of their historical habitat due to climate change while habitat more suitable to Chinook salmon, walleye and lean lake trout has been enhanced thus providing better information for assessing the Lake Superior fishery.

Wisconsin Sea Grant research led to the successful development and deployment of two models of electroshocking, suction sampling, remotely operated vehicles.

Reviewer: Jim Murray

Reviewer Type: 2

To reduce fishery conflicts, WISG conducts an information-sharing campaign about the location of trap nets that has reduced disputes and trap net damages.

With WISG help, the city of Racine is lining up investors for a yellow perch grow-out facility that would produce 1 million pounds of fish a year, generating an estimated \$13 million annually. The work with Growing Power, which employs 80 people in urban aquaculture and expanding is quite impressive.

WISG's Eat Wisconsin Fish campaign is forging has led to a Milwaukee restaurant planning to purchase more than \$100,000 in Wisconsin fish in the coming five years.

A Wisconsin Sea Grant researcher modeled waves and is providing realtime information on conditions to prevent tragedies through a beach installed information kiosk that has improved safety in the Apostle Islands.

Numerous other outreach events and products were listed (apps, podcasts, etc.) that add to the accomplishment list.

2015 Performance Review Panel Summary for

Wisconsin Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 1.5

This is a longstanding and highly productive and focused program. With clearly articulated objectives, this program meets or exceeds these objectives and their performance measures consistently. They conduct research to complete stock assessments using new modeling techniques for both commercial and recreational species (e.g. trout, yellow perch). They are working with the industry to establish new markets for both native and non native species. They are supporting a considerable amount of education and outreach to prevent more invasive species from becoming established and have conducted research describing the economic impact of invasive species on the Great Lakes system. They are advocating for the consumption of local seafood and including through the use of downloadable apps for smartphones. Understanding the potential economic impact of aquaculture and its importance as providing consumers an alternative to wild stocks, they are investing a significant amount of funding and outreach to expand aquaculture throughout the Great Lakes and for iconic species such as walleye. They are working with aquaculturists to insure that products are safe for consumption. Much of the research and outreach approaches are transportable to other regions and nations. This is an exemplary program that has identified key issues that they can support/fund to make a real difference both for people engaged in fishing and aquaculture and consumers of seafood.

This program has had some significant impacts such as bringing tribal and commercial fishing groups together to solve a significant issue which had been intractable until WSG took the lead. Their efforts to advocate for consumption of local fish is leading to the establishment of new markets both for native and non native species. In addition, their focus on aquaculture and safe practices may translate into an expanded industry and will insure that safe seafood is available to meet increasing demand. The Great Lakes are the home to over 180 species of invasive species according to WSG and to develop fisheries for non native species while educating the public to prevent further invasions is an appropriate and significant contribution that needs to continue.

2015 Performance Review Panel Summary for

Woods Hole Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 2.5

WOODSHOLE SEA GRANT PROGRAM EVALUATION FORM: VANCE P. VICENTE

Woods Hole Sea Grant Program is based at the WHOI and now has a current status as an Institutional Sea Grant Program. WHSG has identified the revitalization of fisheries and sustainable aquaculture as priority areas. Significant advances in science under this program includes spawning site fidelity studies of the horseshoe crab, bay scallop recruitment model, multicropping shellfish and macroalgae for business and bioextraction, decadal changes in Georges Bank food webs and many extension and outreach activities related to coastal conditions (water quality studies) fisheries, aquacultures and specific problems associated to these.

There were three major goals proposed for the 2010-2013 program on the Safe and Sustainable Seafood Supply Focus Area. There were 23 impacts and three accomplishments related to Program Goal 1 (To maintain and improve marine and estuarine habitat important to commercially important wild resources).

Under Goal 1, the objective 1 (to implement an eelgrass planting/restoration program to improve habitat conditions for shellfish) was not addressed. However, 10 of the 23 impacts do address habitat maintenance and improvement indirectly through bioextraction and other. Also, many of the impacts relate to habitat (invasive species diseases associated to habitat changes, and water quality data acquisition) and others. The accomplishments of Goal 1 do not address specific actions taken by WHSG to “maintain and improve marine and estuarine habitats” as will be discussed in my presentation.

There were 35 impacts associated to Program Goal 2 (To enhance, restore and/or maintain wild populations of commercially important resources). Collection of water quality data and other baseline data are of relevance to this goal. Furthermore, if the shellfish propagation programs are used in part to re-seed depleted wild stocks then this goal would be achieved to a greater extent, but this is not clear. The consideration of using alternative species for fisheries and aquaculture should release fishing pressure on presently targeted species which would enhance commercial populations in the wild. In addition, understanding the causes of shellfish diseases could help us mitigate their effect on wild stocks. Each Impact will be discussed in my presentation in more details. Some of the impacts under Goal 2 respond better to other goals as will be discussed. The accomplishments do not seem to be directly attached to Program Goal 2 (enhance restore /maintain wild populations of commercial species) but rather to shellfish production.

Reviewer: Vance Vicente

Reviewer Type: 1

Under Program Goal 3 (Stakeholders in the southern New England region will use knowledge gained from Woods Hole Sea Grant programs to promote science-based decision making on safe harvesting of shellfish stocks) there were 36 impacts listed. These impacts were mostly related to the Goal's subject matter. In addition, the promotion of science-based decision making on shellfish harvesting matters have reached different levels of the community including fishers, aquaculturists and others as will be discussed in the presentation. This outreach is also reflected in the PG3 Accomplishments #21588 and #20775.

In total there were 13 Performance Measures (2010-2013). Of these, 12 (92.3%) exceed the Program Plan Targets and according to the evaluation, both objectives were achieved, but these need to be discussed.

2015 Performance Review Panel Summary for

Woods Hole Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3.5

WHSG has established itself a specialist and expert in aquaculture and the NE shellfish industry. Many projects support expansion of the industry and ways to increase production, minimize disease loss, and Annual monitoring of shellfish beds continues to be conducted. While this baseline monitoring is critical to the continued success of the shellfish industry, it could be extended and expanded to generate new understandings insights. Where WHSG has partnered with other institutions to conduct research and played more of a role in information dissemination and communication (i.e. alternatives analysis for fisheries and aquaculture), the impact of research has been more visible and follow up greater. Most of the research studies listed did not include obvious plans for extension, and while they clearly tie to the NE and MA shellfish industry and fisheries in general, developing a clearer pipeline for dissemination of information and for these to tie back to management would increase the impact of the science. Currently it is unclear the impact of many of the ongoing studies and new areas of research.

WHSG extension programs prioritize the shellfish industry and work to ensure the success of aquaculture programs. Extension programs have included follow up that indicate efforts with direct education, by hosting training workshops for the Volunteer Community Shellfish Action Program, indicate that knowledge was gained by attendees in biology and importance of shellfish regulations and following safety protocols. Much of WHSG's work in this area has been done through partnerships with local networks (i.e. Barnstable count, River Herring Network), and WHSG plays a role of coordinating and leadership for other local bodies. To this extent, WHSG helps elevate projects on a local level to increase the scope of impact to the state and regional level by leveraging ongoing work by partners at the local level and facilitating fora for discussion and exchange of information. In this position, WHSG has position itself as an expert in shellfish aquaculture and also provides 8-week shellfish training courses for current and prospective farmers. Additional data on how attendees have reviewed this course or how it has impact business practices is necessary to fully understand how it has support the industry and added value.

2015 Performance Review Panel Summary for

Woods Hole Oceanographic Inst. Sea Grant

Safe and Sustainable Seafood Supply

DRAFT Rating: 3

The Woods Hole Sea Grant Program received \$1,401K in national funds for SSSS.

WHSG had a relatively large number of impacts and accomplishments under all three of its program goals, related to habitat, commercially important fishery resources, and safe harvest of shellfish stocks.

Research projects supported by Woods Hole Sea Grant include investigations of the early life history and reproduction of different species of fish and shellfish; modeling approaches

to understand recruitment patterns of commercially and recreationally important species; characterization of critical habitats for fish and shellfish; and multi-cropping of shellfish

and seaweed for harvest.

Highlights include research on spawning site fidelity of horseshoe crabs, a recruitment model for bay scallops, multi-cropping of shellfish and seaweed, and decadal changes in food webs on Georges Bank.

These are diverse research areas that all seem pertinent to current issues in the region.

WHSG administers a shellfish program for 15 towns in Barnstable County, benefiting the towns and over 17,000 recreational and 1,000 commercial shellfish harvesters.

WHSG provides important monitoring and outreach regarding *Vibrio* and other diseases to promote sustainable management and safe seafood.

WHSG assists communities in managing local river herring fisheries, a tradition that dates back to colonial times.

WHSG appears to have met or exceeded 12 of 13 performance measures, although the performance targets for 5 measures are not in the PIER report. WHSG achieved 2 of 2 program objectives.

Reviewer:
Reviewer Type:

**2015 Performance Review Panel Summary for
Sea Grant**

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